

VERIFICATION REPORT

8000400358 - 11/538



Project Title	CATALYTIC REDUCTION OF N ₂ O INSIDE THE AMMONIA BURNERS OF THE NITRIC ACID PLANT IN CAOJING, SHANGHAI
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Summary:

Shanghai BASF Polyurethane Co. Ltd. Has commissioned the TÜV NORD JI / CDM Certification Program to carry out the 2nd verification of the project “Catalytic Reduction of N₂O inside the Ammonia Burners of the Nitric Acid Plant in Caojing, Shanghai” in Shanghai, Peoples Republic of China with regard to the relevant requirements of VCS 3.0 Standard.

The project activity entails the installation of a secondary catalyst in the ammonia reactor at the nitric acid production unit of Shanghai BASF Polyurethane Co. Ltd. Plant. Thereby reducing the emission of N₂O as a potent GHG in to the atmosphere.

Reporting period: From 01-07-2010 to 23-05-2011 (both dates included)

A risk based approach has been followed to perform this verification. In the course of the verification four (04) Corrective Action Requests (CAR) and six (06) Clarification Request (CL) were raised and closed successfully. Two (02) Forward Action Requests (FAR) remain still open.

The verification is based on the draft monitoring report, final monitoring report, the monitoring plan as set out in the validated VCS PD and verification handbook, the validation report, emission reduction calculation spreadsheets and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant.

As the result of the 2nd periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. TÜV NORD JI/CDM CP herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

01-07-2010 until	31-12-2010	313,907	tCO ₂ equivalents
01-01-2011 until	23-05-2011	264,990	tCO ₂ equivalents

Total Emission reductions for this monitoring period: 578,897 tCO₂ equivalents

Table of Contents

1	Introduction	5
1.1	Objective	5
1.2	Scope and Criteria	5
1.3	Level of assurance	5
1.4	Summary Description of the Project	5
2	Validation Process, Findings and Conclusion	7
2.1	Validation Process	7
2.2	Validation Findings	8
2.2.1	Gap Validation	8
2.3.2	Methodology Deviations	8
2.3.3	New Project Activity Instances	8
2.4	Validation Conclusion	8
3	Verification Process	9
3.1	Method and Criteria	9
3.2	Appointment of team members and technical reviewers	9
3.3	Document Review	11
3.4	Interviews	11
3.5	Site Inspections	11
3.6	Resolution of Any Material Discrepancy	12
4	Verification Findings	13
4.1	Project Implementation Status	13
4.2	Accuracy of GHG Emission Reduction or Removal Calculations	21
4.3	Quality of Evidence to Determine GHG Emission Reductions or Removals	28
4.4	Management and Operational System	29

5	Verification conclusion	31
6	References:.....	32

1 INTRODUCTION

1.1 Objective

The purpose of this verification, by independent checking of objective evidence, is as follow.

- To verify that the project is implemented as described in the project design document;
- To assess the implementation of the monitoring plan (MP) content in the VCS-PD;
- To assess the project's compliance with other relevant rules, including the host country (P.R. China) legislation;
- To confirm that the monitoring system is implemented and fully functional to generate voluntary emission reductions (VERs / VCUs) without any double counting; and
- To establish that the data reported are accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation.

1.2 Scope and Criteria

The verification of this project is based on the validated project design document ^{/VCS-PD/}, the monitoring report ^{/MR/}, verification handbook ^{/VER HB/}, emission reduction calculation spread sheet ^{/XLS/}, supporting documents made available to the verifier and information collected through performing interviews ^{/IM01/ & /IM02/} and during the on-site assessment. Furthermore publicly available information was considered as far as available and required.

The TÜV NORD JI/CDM CP has employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of emission reductions.

1.3 Level of assurance

The verification has been planned and organized to achieve a

- ☒ Reasonable level of assurance
- ☐ Limited level of assurance

1.4 Summary Description of the Project

The project involves the installation of a secondary N₂O reduction catalyst in the ammonia oxidizer of the nitric acid production plant of Shanghai BASF Polyurethane Co., Ltd..

The emission reductions are a result of the catalytic decomposition of nitrous oxide (N₂O). Nitrous oxide which is formed as by-product of the nitric acid production will be removed by a secondary catalyst installed directly below the ammonia oxidation gauzes. The nitrous oxide would otherwise be emitted within the tail gas of the nitric acid plant to the atmosphere.

Essential data of the project is presented in following table 1-4a:

Table 1-4b: Essential Data of the Project

Item	Data
Project title	Catalytic Reduction of N ₂ O inside the Ammonia Burners of the Nitric Acid Plant in Caojing, Shanghai
Project owner	SHANGHAI BASF POLYURETHANE CO. LTD.
Any specific project categories	☐ Mega project (> 10 ⁶ t CO _{2eq} / a) ☐ Micro project (< 5000 t CO _{2eq} / a) ☐ AFOLU project ☐ Grouped project ☒ No specific project category
VCS PD	2010-07-24
Applied Methodology	AM 0034 Version 3.2
Project starting date	2009-11-28
Technical Area(s)	5.1 N ₂ O
Crediting period	☐ Renewable Crediting Period (7 y) ☒ Fixed Crediting Period (10 y)
Start of crediting period	2009-11-28

The Technical Specification of project activity is provided in table 1-4b:

Table 1-4b: Technical Data of the Project

Parameter	Values
NH₃ – Oxidizer	
Manufacturer	Oschatz, Germany
Diameter	5056 mm
Start of commercial production	2006-07-15
Operating conditions as per specifications	
- Temperature (min/max):	830 – 900 °C
- Pressure (min/max):	0.28 – 0.45 Mpa

- Ammonia flow rate (max):	11.250t/h (110 % load)
- Ammonia to Air ratio (max)	11.35 Vol.-%
Ammonia Oxidation Catalyst	
Manufacturer	- *)
Composition:	Pt: - *) Rd: - *) Pd: - *)
Absorber	
Manufacturer	Caldemon Iberica. S.A.
Design capacity as per as per name plate information and operation manual (100% HNO ₃)	335,800 t/a
N₂O Analyzer	
Manufacturer	ABB
Type	AO2240-URAS 26 N2O
Measurement Principle	NDIR
Serial No.	3.356558.8
Stack volume flow rate measurement	
Manufacturer	Dr. Födisch Umweltmesstechnik AG
Type	Flow Measuring Device FMD 99
Measurement Principle	Differential Pressure

*) The values are based on plant records of the historic campaigns as available from 2007-01-01.

2 VALIDATION PROCESS, FINDINGS AND CONCLUSION

2.1 Validation Process

Method and Criteria:

Not Applicable. The project was successfully validated by the TUV Nord and project participant provided the validated PD^{/VCS-PD/} and Final Validation Report^{/FvalR/} to the verification team

Document Review:

Not Applicable.

Interviews:

Not Applicable.

Site Inspections:

Not Applicable.

Resolution of Any Material Discrepancy:

Not Applicable. The project was successfully validated by the TUV Nord and project participant provided the validated PD^{/VCS-PD/} and Final Validation Report^{/FvalR/} to the verification team

2.2 Validation Findings

2.2.1 Gap Validation

Not Applicable. The project was successfully validated by the TUV Nord and project participant provided the validated PD and Final Validation Report to the verification team.

2.3.2 Methodology Deviations

No methodology deviation foreseen during the current monitoring period.

2.3.3 New Project Activity Instances

No new project activity instances are identified or proposed by the project proponent during the current monitoring period.

2.4 Validation Conclusion

Not Applicable. The project was successfully validated by the TUV Nord and project participant provided the validated PD and Final Validation Report to the verification team.

3 VERIFICATION PROCESS

3.1 Method and Criteria

The verification of the project consisted of the following steps:

- Contract review
- Appointment of team members and technical reviewers
- Publication of the monitoring report
- Desk review of the Validated PD^{/VCS-PD/}, Monitoring Report^{/MR/} and Emission reduction calculation spread sheet^{/XLS/} submitted by the client and additional supporting documents
- Verification planning
- On-Site assessment
- Background investigation and follow-up interviews with personnel of the project developer and its contractors
- Draft verification reporting
- Resolution of corrective actions (if any)
- Final verification reporting
- Technical review
- Final approval of the verification.

The sequence of the verification is given in the table 3.1 below:

Table 3.1: Verification sequence

Topic	Time
Assignment of verification	2011-09-19
On-site visit	2011-11-08 until 2011-11-10
Draft reporting finalised	2012-03-10
Technical review on draft reporting finalised	2012-07-09
Final reporting finalised	2012-07-09
Rev 1 (minor corrections)	2012-09-30

The main verification steps are described below.

3.2 Appointment of team members and technical reviewers

On the basis of a competence analysis and individual availabilities a validation team, consistent of one team leader and 2 additional team members, were appointed. Furthermore also the personnel for the technical review were appointed.

The list of involved personnel, the tasks assigned and the qualification status are summarized in the table 3-2 below.

Table 3-2: Involved Personnel

	Name	Company	Function ¹⁾	Qualification Status ²⁾	Scheme competence ³⁾	Technical competence ⁴⁾	Host country Competence	Team Leading Competence	On-site Visit
☒ Mr. ☐ Ms.	Winter, Rainer	TÜV NORD CERT	TL	SA	☒	5.1	☐	☒	
☒ Mr. ☐ Ms.	Lin, Nat	TÜV NORD, Shanghai	TM	LA	☒		☒	☒	☒
☒ Mr. ☐ Ms.	Speyer, Dirk	TÜV NORD CERT	TM	A	☒	5.1	☐	☐	☒
☒ Mr. ☐ Ms.	Walter, Ulrich	TÜV NORD CERT	TR ³⁾	LA	☒	5.1	☐	☒	
☒ Mr. ☐ Ms.	Schubert, Jochen Dr.	TÜV NORD CERT	TR ³⁾ FA ³⁾	SA	☒		☐	☒	

TL: Team Leader; TM: Team Member; TR: Technical review; OT: Observer-Team; OR: Observer-TR; FA: Final approval

²⁾ GHG Auditor Status: A: Assessor; LA: Lead Assessor; SA: Senior Assessor; T: Trainee; TE: Technical Expert

³⁾ GHG auditor status (at least Assessor)

⁴⁾ As per S01-MU03 or S01-VA070-A2 (such as 1.1, 1.2, ...)

^{A)} Team Member: GHG auditor (at least Assessor status), Technical Expert (incl. Host Country Expert or Verification Expert), not ETE

^{B)} No team member

All team members contributed to the review of documents, the assessment of the project activity and to the preparation of this report under the leadership of the team leader.

Technical Experts contributed to the assessment of special aspects of the project activity, e.g. technical or host country aspects.

In order to qualify further personnel the project team was accompanied by observers and/or trainees as indicated in the table above. They are usually not considered as team members.

3.3 Document Review

The VCS PD ^{/VCS-PD/}, Monitoring report ^{/MR/} and supporting background documents related to the project design and baseline were reviewed.

Furthermore, the verification team used additional documentation by third parties like host party legislation, technical reports, operational manual or to the basic conditions and technical data.

The references used in the course of this verification are summarized in section 6.

3.4 Interviews

The verification team has carried out interviews in order to assess the information included in the project documentation and to gain additional information regarding the compliance of the project with the relevant criteria applicable for the VCS.

During verification the verification team has performed interviews to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarized in Table 3-2.

Table 3-2: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
1. Project proponent representatives (Shanghai BASF Polyurethane Co. Ltd.) ^{/IM01/} 2. Project consultant (Future Camp Climate GmbH) ^{/IM02/}	- General aspects of the project - Technical equipment and operation - Changes since validation - Monitoring and measurement equipment - Calibration procedures - Quality management system - Involved personnel and responsibilities - Training and practice of the operational personnel - Implementation of the monitoring plan - Monitoring data management - Data uncertainty and residual risks - GHG calculation - Procedural aspects of the verification - Maintenance - Environmental aspects - Editorial issues of the Monitoring Report

A comprehensive list of all interviewed persons is part of section 6 'References'.

3.5 Site Inspections

As most essential part of the verification exercise it is indispensable to carry out an inspection on site in order to verify that the project is implemented in accordance with the applicable criteria. The verification team has carried out an inspection on sit in order to verify that the project is implemented in accordance with the applicable criteria. Furthermore, the on-site assessment was conducted and monitoring data were checked with respect to accuracy to ensure the calculation of emission reductions. The main tasks covered during the site visit include, but are not limited to:

- The on-site assessment included an investigation of whether all relevant equipment is installed and works as anticipated.
- The operating staff was interviewed and observed in order to check the risks of inappropriate operation and data collection procedures.
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The duly calibration of all metering equipment was checked.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked completely.
- The data aggregation trails were checked via spot sample down to the level of the meter recordings.

The on-site visit was carried out on 2011-11-08 until 2011-11-10. Two member of the Verification team attended the site visit.

3.6 Resolution of Any Material Discrepancy

Material discrepancies identified in the course of the verification are addressed either as CARs, CLs or FARs.

A **Corrective Action Request (CAR)** is established where:

- Mistakes have been made in assumptions, application of the methodology or the project documentation which will have a direct influence the project results,
- The requirements deemed relevant for verification of the project with certain characteristics have not been met or
- There is a risk that the project would not be registered or that emission reductions would not be able to be verified and certified.

A **Clarification Request (CL)** will be issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

A **Forward Action Request (FAR)** will be issued when certain issues related to project implementation should be reviewed during the first verification.

A detailed list of the CARs CLs and FAR raised and discussed in the course of this verification is included in the next section 4 of this report.

4 VERIFICATION FINDINGS

In this section the assessments and findings from the desk review of the VCS PD, site visit, interviews and supporting documents as well as the final assessments are summarised. Table 4-1 includes an overview of all raised CARs, CLs and FARs.

Table 4-1: Overview of CARs, CLs and FARs issued

No.	Topic / Chapter	CAR	CL	FAR
4.1	Project implementation status	2	3	2
4.2	Accuracy of emission reduction calculations	2	2	-
4.3	Quality of evidence to determine emission reductions	-	-	-
4.4	Management and operational system	-	1	-
-	SUM	4	6	2

4.1 Project Implementation Status/Remaining issues, including any material discrepancy

The project activity entails the operation of a secondary catalyst (N₂O reduction) in the ammonia reactor at nitric acid production plant of Shanghai BASF Polyurethane Co. Ltd..

The project location address is No.25 Chu Hua Road in Caojing Shanghai / People's Republic of China (Latitude: 30°47'13''N; Longitude:121°27'51''E).

The project proponent, SBPC has installed a Continuous Emission Monitoring system provided by M/s ABB AO2000 URAS 26 comprising of a Continuous Emissions Analyser according to EU standards (EN14181) for measuring N₂O concentration in the stack gas, a stack gas Flow Sensor by M/s Dr. Födisch, Germany (FMD 99) and a data processing unit provided by M/s Durag, Germany (D-EMS-2000). The project was validated by TÜV NORD and the project equipment has been installed before the VCS registration. The N₂O reduction catalyst was installed in the burner and operational before first monitoring campaign (2009-11-23) and was topped-up during the sec. monitoring campaign.

The monitoring system has been established on the basis of the approved CDM methodology AM0034 version 03.2 and the validated monitoring plan as described in the VCS-PD.

During the verification of first monitoring period the following 4 FARs were issued and taken into account during this verification:

- *FAR 3.1-2: "The verifier needs to check whether the project takes part in any other GHG programme".* This issue was discussed in detail with the PP during the site visit. The PP has confirmed that a) no other activities related to any other GHG programme have been carried

out and b) no other activities are intended to be carried out. Nevertheless the PP is requested to issue a corresponding undertaking. In this context the CL 4.1-1 was raised during this verification. The verification team has further checked publicly available information to find out, whether another registration under any other GHG scheme has been achieved or is underway. No indication of such activities was achieved by the verification team. In order to ensure that this issue is addressed again during the next periodic verification the FAR remains active.

- *FAR 3.3-5: "The provisions of the (validated) VER handbook are considered to substitute the MP provisions of the validated VCS-PD. Thus future verifications should be carried out against the provisions of the MP as described in the valid VER Handbook."* CL 4.1-3 was raised. The verification team confirms that the verification process has taken the VER Handbook appropriate into account. As this finding is relevant for further verifications FAR remains still open.
- *FAR 3.4-2: "The substitute value strategy, to account for downtimes of the monitoring system could be simplified for future verifications."* The verifier has checked the ER calculation and concludes that during the second monitoring period a "better" approach was taken to substitute values for downtime of equipment. The approach is full in compliance with AM0034 version3.2. For AMS down-time intervals during the project campaign the highest measured emission factor is applied correctly.
- *FAR 3.6-1: "A procedure to backup the DURAG data could not be evidenced during the onsite visit."* In this context the CL 4.4-1 was raised during this verification. During the onsite visit for 2nd monitoring period the issue was checked in detail and it can be concluded that the PP has procedures implemented to prepare data back-ups for continuously archiving.

Related Findings

- ☐ No CARs, CLs or FARs have been identified in this context
- ☒ The following finding(s) have been addressed:

Finding:	CL 4.1-1		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	An undertaking shall be provided that the project does not take part in any other Emissions trading scheme.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	A confirmation regarding this proof has been prepared and submitted to the audit team during verification meeting.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	SBPC offers a commitment that the project is only applying for crediting under the VCS standard. The PP confirmed that no other activities related to any other GHG programme have been carried out. The verification team has also checked publicly available information to find out, whether another registration under any other GHG scheme has been achieved or is underway. No indication of such activities was achieved by the verification team. CL is closed.		

Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements
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Finding:	FAR 4.1-2		
Classification	☐ CAR	☐ CL	☒ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The verifier needs to check whether the project takes part in any other GHG programs.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>			
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>			
Conclusion <i>Tick the appropriate checkbox</i>	☒ To be checked during the next periodic verification ☐ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

Finding:	CL 4.1-3		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	There was a FAR left from the first monitoring period as: the provisions of the (validated) VER handbook are considered to substitute the monitoring plan provisions of the validated VCS-PD. Thus the verifications should be carried out against the provisions of the MP as described in the valid VER Handbook.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The project monitoring has been implemented according to the description of the updated VER handbook. The Monitoring Report is also in line with procedures and details outlined in the handbook.		

DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The verification team confirms that the verification process has taken the VER Handbook appropriate into account. The verifier confirms that all operations of the project are implemented and installed as planned and described in the validated VCS-PD and monitoring plan as per VER handbook. The monitoring plan is in accordance with the requirements of AM0034.
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies the requirements

Finding:	FAR 4.1-4		
Classification	☐ CAR	☐ CL	☒ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The provisions of the (validated) VER handbook are considered to substitute the MP provisions of the validated VCS-PD. Thus future verifications should be carried out against the provisions of the MP as described in the valid VER Handbook.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>			
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>			
Conclusion <i>Tick the appropriate checkbox</i>	☒ To be checked during the next periodic verification ☐ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies the requirements		

Finding:	CL 4.1-5		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Clarification is requested on the determination of the parameter OH.		

Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	Misleading information on OH formation in flowchart 5-1 has been corrected. Furthermore Tables 4-2 and 4-3 have been amended, including more detailed information on the generation and archiving of the digital signal. A comprehensive explanation on OH formation is provided in table 7-1 where the content has been made more explicit: “The status of the plant (in operation/out of operation) is clearly identified via signal from ammonia feed control valve FFC110137. This control valve is equipped with a limit switch at 0% (closing). When valve position departs from "0%" (closing point), it will send out a digital signal "1" (plant in operation) to DCS, while when valve hits the limit switch at "0%" (closing), a digital signal "0" (plant out of operation) is sent to DCS. Thus opening the valve means plant starts/is in operation, while closing of the valve means plant shut-down and out of operation. There is parallel archiving in DCS as well as DURAG, allowing for cross-checking of data.”
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The verifier concludes that OH is determined on basis the ammonia flow input and monitored via signal from ammonia feed control valve FFC110137. This situation was also observed during the onsite visit. Misleading information in the project documentation was revised. CL has been closed.
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

Finding:	CAR 4.1-5		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Monitoring report version 1: It was identified during the on-site verification that there was another flow meter instrument (F130217) which was used to monitor the production of nitric acid. The VCS handbook should be updated accordingly. The secondary NAP flow and used measurement instruments should be described in detail.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The VER handbook has been amended accordingly. Please see revised flowdiagram (Figure 4-1: Gas flows and Measurement Points) and amended instrument table (Table 4-2: Installed measuring instruments and parameters for project monitoring). This is also reflected in the report.		

DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The verifier confirms by referring to the monitoring instrument documentation that the use of the second flow meter has no material effect on the accuracy of the monitored values for nitric acid determination. The flow meter for secondary flow is technically the same as the one for primary nitric acid flow. The verifier concludes that the instrument is proper calibrated and suitable for the measurement. For the secondary NAP flow meter a two times higher frequency of lab concentration analyses is also applied. The project documentation was revised accordingly. Therefore the use of second flow meter is acceptable and CAR closed.
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

Finding:	CAR 4.1-6		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Monitoring report version 1 As per AM0034 the max. estimated HNO₃ production used for ER calculation should not exceed the nameplate (design) capacity. During onsite visit it has been identified that the produced amount of nitric acid during this campaign is higher than the validated value as per registered PD. The value of production capacity of the plant given in the operation manual differs from this validated value in PD. Clarification is requested.		

Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	Caojing HNO₃ plant is part of a larger industrial complex that includes TDI as well as MDI production facilities. The capacity information for the HNO₃ production that was included in the PD refers to integrated data from planning documents which themselves refer to downstream TDI as well as MDI capacities to process nitric acid. Thus, while this downstream consumption figure was relevant for planning and realization of the whole complex, it was only a minimum requirement for the HNO₃ plant capacity and not the decisive factor for it. In fact the nameplate capacity as per plant manual (see manual section 2.1 on plant capacity) is higher, indicating • production of 866 t/day (basis 100% HNO₃, 100% load) • plant flexibility range of up to 110% load and • service factor of 8,460 hours/year. The capacity maximum according to the above given parameters is 335.8 kt of HNO₃ per year. The production of 2010 (213.9 kt) is still well within this range. The bullwark of the production is provided to TDI and MDI production facilities. A further production volume is sold to outside consumers. This description has been included in the revised handbook (see new chapter 8) and the respective plant capacity figure corrected accordingly (see MR, section 1.1).
DOE Assessment #1 <i>The assessment shall encompass all open issues in annex A-1. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The verifier has checked project documentation and plant manual (nameplate) of the nitric acid facility and concludes that the design capacity maximum (110%load, service factor of 8,460 hours/year) is 335,800 t of HNO₃ (100%) per year. The verification team concludes that lower figures (265,000 tHNO₃ 100%) per year in PD were based on assumption during the planning stage and not as per design capacity of the nitric acid plant. CAR has been closed out.
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

Final Assessment

During the verification a site visit was carried out. On the basis of this site visit and the reviewed project documentations, it can be confirmed that w.r.t. the realized technology, the project equipments, as well as the monitoring and metering equipment, the project has been implemented and operated as described in the validated PD^{/VCS-PD/} except the changes described below. The name plate specifications including make, capacity and serial number of the relevant plant and project equipments have been verified by the DOE during onsite visit. There are no major changes in the key equipment except the changes described below since the validation of the project. Also no change is envisaged. These facts have been verified during site visit. All raised CARs and CLs were successfully closed during the verification of 2nd monitoring period and there are no remaining issues.

During the site visit the verifier identified two deviations/changes related to the project design. The following table includes the deviations from the validated monitoring plan as described in the VCS-PD. As a part of this verification the verifier has carried out the assessment of the listed deviations against this criterion. The specific validation opinion is included in below table.

No.	Deviation issue	Validation opinion
1	Change of the capacity information for the HNO ₃ production that was originally included in the validated VCS-PD to the design capacity maximum (110%load, service factor of 8,460 hours/year) of 335,800 t HNO ₃ (100%)/year as per name plate.	This change is acceptable. The value of production capacity of the plant given in the operation manual differs from the originally validated value in PD. The verifier has checked project documentation and plant manual (nameplate) of the nitric acid facility and concludes that the design capacity maximum of 335,800 t HNO₃ (100%) per year is reasonable and evidenced. The verification team concludes that original lower figures of 265,000 tHNO₃ per year were based on assumption during the planning stage and not as per design capacity of the nitric acid plant.
3	Introduction of secondary NAP flow meter (F130217) for measuring a secondary higher concentrated NAP flow during certain periods.	This change is acceptable as it has no material effect on the accuracy of the monitored values for nitric acid determination. The verifier confirms by referring to the monitoring instrument documentation that the flow meter for secondary flow is technically the same as the one for primary nitric acid flow. The verifier

		concludes that the instrument is proper calibrated and suitable for the measurement. For the secondary NAP flow meter a two times higher frequency of lab concentration analyses is also applied.
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The following table includes a list of deviations from the validated monitoring plan as described in the VCS-PD which have already been assessed by the verifier in the course of the first monitoring period. The deviations have no impact negatively on the conservativeness of the applicable methodological criteria and procedures.

No.	Deviation issue	Validation opinion
1	Introduction of additional monitoring parameters CL_{BL} and CL_n	These parameters have been included only for reasons of transparency. Basically this is the same parameter as NAP.
2	Renaming of parameters oxidation temperature and pressure (OT_{BC} , and OP_{BC}). BL, for baseline campaign has been substituted by BC	The change in parameter names has only been introduced for reasons of consistency and thus has no influence on the monitoring approaches.
3	Data storage provisions have been changed to allow the substitution of paper by other electronic means	This change is acceptable as it does not affect the intended redundancy of the monitoring information

As per the above discussion all above described deviations are acceptable and should further on be considered to constitute (together with all other provisions of the MP as described in the VCS-PD) a revised monitoring plan which is to be followed in future monitoring periods.

During the second periodic verification the verification team assessed the completeness of the monitoring system against the provisions of the MP. It is confirmed that all provisions of this monitoring plan are met during the 2nd monitoring period, i.e.:

- All monitoring parameters listed in the MP have been monitored,
- All provisions regarding the monitoring equipment to be used have been met,
- All provisions regarding the frequency of monitoring are in line with the MP stipulations,
- The QA/QC procedures related to the monitoring have been established and were found to be effective.

4.2 Accuracy of GHG Emission Reduction or Removal Calculations

Description : During the on-site visit the verification team has collected and reviewed evidences of

original measurement results, as obtained by the installed monitoring system. Furthermore all systems and procedural steps involved in the data aggregation have been checked in detail and corresponding data has been collected in order to enable the conceptualized detailed audit testing procedures. The verification team was also focussed to observe actual monitoring practices. The team has interacted with the operational personnel responsible for the monitoring of the project activity in order to observe, as far as possible, how relevant monitoring practices and measures to ensure the accuracy of the monitoring results, such as functional tests, calibrations etc. are carried out. All monitored data has been checked for the second project campaign.

In order to implement the monitoring plan in the context of the project activity and to give additional guidance for the personnel involved in the monitoring, the PP has decided to create a so called VER handbook. This VER handbook includes all provisions of the validated monitoring plan. The monitoring system has been established on the basis of the approved CDM methodology AM0034 version 03.2 and the validated monitoring plan as described in the VCS-PD and VER handbook. The project monitoring follows the provisions of the international standard EN 14181.

The calculation of the emission reduction is based on hourly averages data or parameters received from the data processing unit (D-EMS-2000). Error readings or implausible values are eliminated. Only hourly data have been used when the nitric acid plant generally operate "normal" in the VCS-PD defined ranges. The statistical evaluations for calculating campaign specific emissions, described in AM0034 /Version 03.2, are applied. For AMS down-time intervals during the baseline campaign the IPCC default value of 4.5 kg N₂O/tHNO₃ was taken into account; for AMS down-time intervals during the project campaign the highest measured emission factor is applied correctly.

Calculation of baseline emission factor: The original baseline campaign length is 180,988 tHNO₃, the average historic campaign length CL_{normal} is 169,992 tHNO₃. Therefore, CL_{normal} was used as a cap on the length of the baseline period CL_{BC} = 169,958 tHNO₃ (adjusted to the normal campaign length). For calculating the emission factor, the overall uncertainty of the monitoring system (UNC = 4.59%) was taken into account. EF_{BC} is calculated traceable and correct to be 7.25 kgN₂O/kgHNO₃.

Calculation of project emission factor: The project campaign length CL_{PC2} = 282,233 tHNO₃ is longer than CL_{normal} = 169,992 tHNO₃. Therefore EF_{PC2} = EF_{ma,n} (moving average factor after nth period).

For the first verification EF_{PC1} was determined as EF_{PC1} = 0.62370 kg N₂O/kgHNO₃. For 2nd monitoring period EF_{PC2} is calculated to be 0.62786 kg N₂O/kgHNO₃. EF_{PC2} is higher than EF_{PC1} or EF_{ma,n} and therefore applied in the calculation of ER.

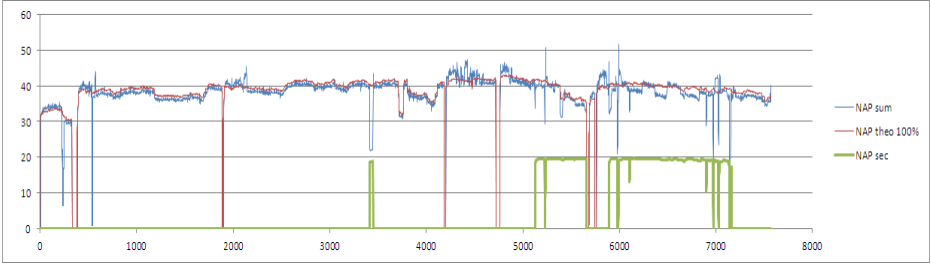
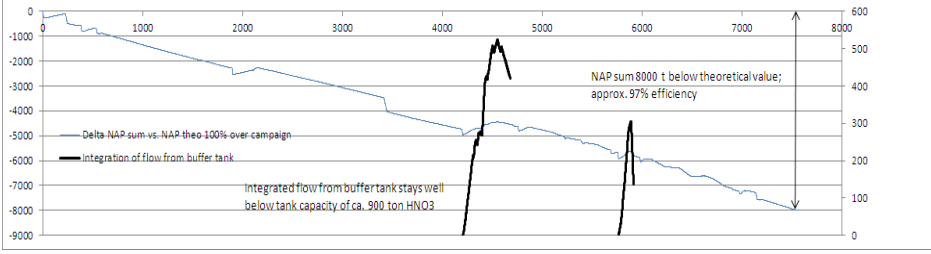
Calculation of emission reduction: The emission reduction for the project campaign #2 is calculated correct, traceable and in according to the requirement of AM0034 version 03.2 to be 578,897 tCO₂e.

Campaign	CL _{PC2} [tHNO ₃]	PE _{PC2} [tN ₂ O]	ER _{PC2} [tN ₂ O]	ER _{PC2} in 2010 [tCO ₂ e]	ER _{PC2} in 2011 [tCO ₂ e]
PC2	282,233	178.41	1,867	313,907	264,990

Related Findings

- ☐ No CARs, CLs or FARs have been identified in this context
- ☒ The following finding(s) have been addressed:

Finding:	CAR 4.2-1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Monitoring report version 1 During onside visit it has been identified that in the verification period some peaks of high NAP flow occurred. It should be clarified that there is no double counting of the NAP flow. The excel file should be revised accordingly.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	In general double-counting of NAP may occur only during times of secondary NAP flow (production of higher concentrated NAP) when we consider data from the DNT inlet flowmeter F130217. These intervals are protocolled and clearly distinguishable. The Data Handling Protocol contains a clear indication of secondary flow start and stop dates. Double-counting would suggest a situation during secondary NAP flow when low concentrated NAP (measured by NAP flowmeter F130202) is sent to the DNT plant inlet (there measured for a second time by inlet flowmeter F130217). This situation though is impossible as valves are controlled to avoid this. Fluctuations are within the ranges of the pump capacities. In times of increased NAP mass flow the nitric acid hold-up in the system decreases.		
DOE Assessment #1 <i>The assessment shall encompass all open issues in annex A-1. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The verification team has checked the nitric acid production figures and opposed the measured amount of nitric acid with the values which can be theoretically produced on basis of ammonia input (mass balance: AFR/17,03*63,01/1000* efficiency). The verification team concludes that for some intervals not reasonable peaks of high nitric acid flow occurs. Further clarification is requested.		

Finding:	CAR 4.2-1
Corrective Action #2 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	In order to give answer to this request, a thorough analysis of hourly NAP data over the campaign was done (see <i>CJ_Calc-tool_PC2_v2-audit_2011-11-08 NAP issue.xlsm</i>). The first graph below is taken from that analysis. It shows a general comparison of NAP flows (secondary and cumulative) with the maximum theoretical production (100% conversion) according to ammonia input.  Over the campaign we see a fluctuation of NAP values – mostly below the theoretical production value but in certain periods also above that value. The fluctuation in production is related to the hold-up in the system that from time to time is growing as well as reduced. Essential to this is a tank with a hold-back of up to 900t HNO₃. The second graph below (blue graph) shows the delta of NAP production vis-à-vis theoretical input-based production figures (100% efficiency). The all-over harvest of NAP in the campaign I the AFR input suggests a reasonable efficiency of 97%. The back-coloured graph accumulates the overall NAP surplus beyond the theoretical 100% production volume for the longest and most significant period as well as of a second period of higher production. The NAP aggregate of the most significant period of higher hourly NAP volumes (higher than theoretically possible from input data) is much less than the 900t of tank volume (~500t HNO₃), thus clearly within the normal hold-up potential of the system. 
DOE	The verification team can accept the explanation and the reason for the deviations between measured and calculated NAP flow. The NAP produced in

Finding:	CAR 4.2-1
Assessment #2 <i>The assessment shall encompass all open issues in annex A-1. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	the campaign related to the measured AFR input suggests a reasonable efficiency of 97%. The verification team has carefully checked the nitric acid plant flow sheet, related technical description, measurement instruments, monitoring methods and production records and concludes that the monitored amount of NAP was measured and determined in line with relevant requirements and on a sufficient and exact way. CAR has been closed out.
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

Finding:	CAR 4.2-2
Classification	☐ CAR ☒ CL ☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The QAL 2 report and AST report used wrong dimensions of the pipe for calculation of volume flow VSG. Clarification is requested if correct values are implemented in the Födisch flow meter.
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The flowmeter is transferring only the velocity (m/s) to the Durag system. Velocity is then (in Durag system) multiplied with a factor for the cross sectional area of the pipe: 1.778946475 m² and 3,600 sec (for conversion in m³/h). This data is consistent with real inner diameter of the pipe.
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The verifier confirms that the wrong dimensions of the pipe reported in QAL 2 report and AST report has no influence on calibration figures or functional check. The PP has evidenced that correct parameter are implemented in the data processing unit (Durag). It can be confirmed that the monitoring parameter volume flow VSG has been measured and determined without material misstatements and in line with all applicable standards and relevant requirements. CL is closed out.

Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies the requirements
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Finding:	CAR 4.2-3		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The starting date of the second verification period should be the next day after the last day of the first verification.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The indicated date in the report has been corrected. Please see indication on cover page as well as well as in section 2.1 (Implementation status).		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The starting day was changed to the next day after the last day of the first verification. The project documentation was corrected correspondingly. The change has no influence on ER as the plant was not in operation during this time. CAR has been closed out.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements		

Finding:	CAR 4.2-4		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The following editorial issues or misstatements in the Monitoring Report (v.01) (and Handbook) provided to the verification team were identified: 1. Data units of the monitoring parameter should be given correctly. 2. Type of project crediting period (fixed crediting period over 10 years). 3. The MR should reflect all significant events. 4. Some monitoring parameter are not listed in the MR. 5. Some descriptions and information of monitored parameter should be corrected. 6. Value for PE.		

Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	1. Data units have been amended (see MR, section 4). 2. The respective mistake has been corrected (see MR, section 1.6) 3. Table 2 of MR names all significant events 4. The list of parameters in the MR has been extended see MR, section 3.2) 5. Parameter tables in the MR have been revised (see MR, section 3.2). 6. The value for PE has been amended (see MR, section 4).
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	All requested changes have been done. A revised MR was prepared by PP and presented to the verifier. CL has been closed.
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

Final Assessment

The reporting ^{/MR/ /XLS/} is in line with the requirements of the validated monitoring plan as well as with the applied methodology AM0034 version 3.2. The reporting procedures reflect the requirements of the monitoring plan ^{/VCS-PD/}. Also the required monitoring systems have been installed and are operational. The meters comply with appropriate quality standards applicable for the used technology. All relevant evidences[/] were fully checked by the verification team during the on-site visit. All evidences are clearly identifiable and assessed to be correct. It could be evidenced that the monitoring system ensures for continuous operation. The verification team has carefully checked all measurement instruments, monitoring methods and cross checked and concludes that all monitoring parameter were measured and determined in line with relevant requirements and on a sufficient and exact way.

The emission reductions were calculated correctly on the basis of the approved AM0034 version 3.2, formulae given in the monitoring report and validated PD ^{/VCS-PD/}. The verification team crosschecked the emission reduction calculations by comparing with original data from AMS, which were found to be correct and without mistakes.

4.3 Quality of Evidence to Determine GHG Emission Reductions or Removals

Description

SBPC has a monitoring system installed which complies with full with the requirements of AM0034 and norm EN 14181. N₂O concentration is measured on a continuous basis with an analyser (AO2000 URAS 26); the volume flow rate of this tail gas is measured by the installed flow sensor FMD99. A three level quality assurance is implemented. QAL1 has been certified for both, the Automated Measuring System (AO2000-URAS26) dated 14-10-2006 ^{/QAL1_NC/} and for the volume flow meter (FMD 99) dated 13-05-2008 ^{/QAL1_V/}. QAL2^{/QCR/} audit has been carried out by AIRTEC Gesellschaft für Umweltmessungen GmbH (AIRTEC is a testing laboratory according DIN EN ISO 17025, accredited by DAP). The calibration was carried out from 13-10-2009 to 15-10-2009. This test confirms the compliance of CEM to AM0034. QAL3 is carried out for the N₂O analyser every week by SBPC E&I Team to ensure continuous correctness of the monitoring system. Results are entered into QAL3 module in the DURAG system. The last annual surveillance test AST has been conducted on 27th till 28th October 2010 by AIRTEC..

The correction factors derived from the calibration curve of the QAL2 audit for all components of the AMS as determined during the QAL2-test in accordance with EN14181 are applied to both NCTG and VTG.

Data output from the analyser will be processed using a data processing system from M/s DURAG GmbH. This processing unit is for a continuous acquisition of all monitored parameter, long-term storage and calculation of data. The data processing system is declared suitable for these performed tasks. The recording frequency of the N₂O analyser and volume flow rate of tail gas (FMD 99) is 2 seconds. The automated measuring system provides continuous readings for gas concentration and volume flow as average values for every 60 minutes of operation. This data from the CEM is available also in Excel format and is cross-checked to confirm the values of project campaign 2 covered under the monitoring period.

The determination of nitric acid production (NAP) during baseline and verification period is based correctly on two continues mass flow measurements and concerning lab analyses of the density.

Related Findings

- ☒ No CARs, CLs or FARs have been identified in this context
- ☐ The following finding(s) have been addressed:

Final Assessment

The monitored data under the project are reliable and accurate to determine emission reductions. The installed monitoring equipment is according and calibrated appropriately to the requirement of AM0034. Calibration procedures and test reports of the meters and monitoring system covering the reported monitoring period were verified for their frequency and traceability to industry standards and EN14181 . Proper data management including of data acquisition, aggregation and data management system is

being followed in project activity. All records needed for monitoring are archived in line with the requirements of the validated monitoring plan ^{/VCS-PD/}. No significant, lack of evidence and missing data were detected during on-site verification. It is evident from the monitoring data that the monitoring system ensures for continuous operation, no major break down has been found during the monitoring period. The data pertaining to the monitoring are maintained in identified records for the entire monitoring period. All the data is in compliance with the figures stated in the monitoring report. Hence the quality of evidence provided is found to be credible and in line with monitoring plan of the validated PD ^{/VCS-PD/}

4.4 Management and Operational System

SBPC is ISO 9001/14001 and 18001 certified ^{/IMS/} and has proper procedures for data monitoring and recording. A CDM team at SBPC is responsible for data collection, analyses and archiving: A task group for the N₂O emission reduction project is supporting SBPC E&I engineer. The E&I engineer is responsible for maintenance and troubleshooting procedures. The calculation of the emission reduction is done by the CDM team and validated by the nitric acid plant manager, who prepares the report. The VCS project activity is reviewed periodically by the VCS Team and discussed weekly at data control and documentation meetings. Clear responsibilities for the project management in regard to the monitoring are implemented ^{/ORG/}. Also concrete troubleshooting procedures have been defined in the VER Handbook. Staff is trained in monitoring procedures, training plans exists and training records are available ^{/SQ/}.

Related Findings

☐ No CARs, CLs or FARs have been identified in this context

☒ The following finding(s) have been addressed:

Finding:	CL 4.4-1		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Monitoring report version 1: There was a FAR left from the first monitoring period as "A procedure to backup the DURAG data could not be evidenced during the on-site visit". Detailed information is required.		

Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	Section 7.3.2 of the Handbook has been amended, now also containing the following explanation: "In order to secure measured data from the DURAG system, in the plant analyser house there is an independent hard disc exclusively for back-up of DURAG database, implementing a continuous "auto backup". Furthermore in case of loss (hard disc worn out etc.) the same measurement data that is stored in the DURAG system may also be retrieved from the DCS. This applies to all historical data as for the DCS system there is a monthly procedure to prepare data back-ups on CDs which are continuously archived."
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The verifier has checked during the onsite visit the back-up procedures for data of the project e.g. from Durag system and concludes that the procedures defined can be assessed as appropriate for the purpose. No deviations thereof have been observed during the verification. CL has been closed
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

Final Assessment

The allocation of responsibilities is documented in a written form and is followed as described in the Validated PD^{/VCS-PD/} and VER-Project-Handbook. Routines for the archiving of data are defined and documented. The project management and procedures defined can be assessed as appropriate for the purpose. No significant deviations thereof have been observed during the verification.

The monitoring personnel are well trained and follow reproducible routines. Thus, they have the necessary competence to carry out the relevant tasks with sufficient accuracy. The training procedures for the monitoring personnel's at the time of joining and further training records were checked by the verification team during the on-site verification and found acceptable. During onsite visit the verification team confirmed the above mentioned monitoring and reporting procedures and also inline with established procedures as mentioned in the monitoring plan of the validated PD.

5 VERIFICATION CONCLUSION

Shanghai BASF Polyurethane Co. Ltd. has commissioned the TÜV NORD JI / CDM Certification Program to carry out the 2nd verification of the Project “Catalytic Reduction of N₂O inside the Ammonia Burners of the Nitric Acid Plant in Caojing, Shanghai” in Shanghai, with regard to the requirements of VCS Version 3 Standard. The verification covers the monitoring period from 01-07-2010 to 23-05-2011.

The project activity entails the installation of a secondary catalyst in the ammonia reactor at the nitric acid production unit of Shanghai BASF Polyurethane Co. Ltd. plant. Thereby reducing N₂O a potent GHG in to the atmosphere.

In the course of the verification 4 Corrective Action Requests (CARs), 6 Clarification Requests (CLs) and 2 Forward Action Requests (FAR) were raised.

The verification is based on the draft monitoring report, revised monitoring report, the monitoring plan as set out in the validated VCS PD, the validation report, emission reduction calculation spreadsheets and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant.

In detail the conclusions can be summarised as follows:

- all operations of the project are implemented and installed as planned and described in the validated project description,
- the monitoring plan is in accordance with the applied approved methodology i.e., AM0034 version 03.2,
- the installed equipment essential for measuring parameters required for calculating emission reductions is calibrated appropriately,
- the monitoring system is in place and functional. The project has generated GHG emission reductions.

As the result of the 2nd periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. TÜV NORD JI/CDM CP herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Project emissions:	55,306t CO ₂ equivalents
Baseline emissions:	634,203t CO ₂ equivalents
Emission reductions:	total 578,897t CO₂ equivalents
	in 2010: 313,907t CO ₂ equivalents
	in 2011: 264,990t CO ₂ equivalents

Essen, 2012-09-30



Rainer Winter
TÜV NORD JI/CDM CP
Validation Team Leader

Essen, 2012-09-30



Dr. Jochen Schubert
TÜV NORD JI/CDM Certification Program
Final Approval

6 REFERENCES:

Table 6-1: Documents provided by the project participant

Reference	Document
/AST/	Annual Surveillance Test 2010, report issued by AIRTEC (version as of 2010-11-19).
/BR/	Breakdown records for the respective equipments related to the for the project activity during the monitoring period.
/BLS/	Business License of SBPC, issued by Shanghai City Industry and Commercial Administration Bureau (renewed on 2009-04-22), operation scope includes, among others, production of MDI, TDI and nitric acid.
/CAG/	- Certificate of Analysis for project's calibration gas (N₂O) issued by Air Liquid Shanghai, dated 2009-10-15 and valid to 2010-10-14. - Certificate of Analysis for project's calibration gas (N₂O) issued by Air Liquid Shanghai, dated 2010-10-13 and valid to 2011-10-12.
/DNH/	Delivery Note by gauze supplier.
/FM/	Technical specification and documentation flow meter F130217for NAP flow
/IAR/	- Internal audit plan of 2010. - Internal audit reports and results respective to the project activity.
/IMS/	1. Quality Management System (ISO 9001: 2008) Certificate of SBPC issued by Shanghai Audit Centre of Quality System. 2. Environmental Management System (ISO 14001: 2004) Certificate of SBPC (2008-12-18) issued by Shanghai Audit Centre of Quality System. 3. Occupation Health and Safety Management System (OHSAS 18001: 1999) Certificate of SBPC (2008-12-18) issued by Shanghai Audit Centre of Quality System. (evidence for Quality Control and Quality Assurance of the SBPC).

Reference	Document
/IMRI/	Instrument Maintenance Records (replacement equipment/meter/instrument)
/IPM/	Invoice of precious metal purchasing.
/LOG/	Log (Records) of the following were checked: • N₂O concentration in the stack gas. • Operating Hours of the reactor. • Average concentration of nitric acid (%). • Gauze composition during project campaign.
/LA/	Layout of the project activity site describing the metering position.
/MR/	Monitoring report for 2 nd MP (version 1), dated 2011-10-28. Monitoring report for 2 nd MP (version 2), dated 2011-12-16 Monitoring report for 2 nd MP (version 2.1), dated 2012-03-02 Final Monitoring report for 2 nd MP (version 2.1), dated 2012-03-02
/MCC/	Preventable Maintenance Checking according to the ISO 9001's procedure: Weekly Zero-check of the N ₂ O Analyzer (Parameter ID: Q120105; Location: A615. SBPC Transmitters preventable maintenance check sheet - F120106-02; Location: A615, - F120106-02; Location: A615, - T110216; Location A615, - T110216; Location A615, - F120106-01; Location A615 - F120106-01; Location A615 - F110137; Location A615 - P110225; Location A615 - P110225; Location A615 - F130201; Location A615
/OM/	Operational manual of nitric acid plant
/ORG/	Organizational chart with roles and responsibility of operating personnel working on the project activity for data collection, archiving and monitoring activities (operational

Reference	Document
	and management structure for the project activity).
/PMA/	Precious metal (Pt, Rd, Pd) Purchase Agreement between supplier and Shanghai BASF Polyurethane Co. Ltd, dated 2006-06-16.
/CQC/	Certifications of Quality of Catalyst Gauze.
/PMR/	Periodic Proof Test and Maintenance Records
/QAL1_VI/	QAL1 report (complete adherence of the measurement system FMD 99 to the requirements of EN14181 and EN ISO 14956) by TÜV Rheinland, dated 13-05-2008.
/QAL1_NC/	QAL1 report (complete adherence to the requirements of the analyzer system URAS26 to the requirements of EN14181), Bundes-Anzeiger, 20 th April 2007, No. 74.
/QCRI/	QAL 2 calibration report, dated 2009-10-13 as per standard (EN 14181).
/SQ/	Staff's Qualification: - Staff's Training records in Maintenance Dept. - Operation training for staffs by experts from SBPC, BASF SE, Dr. Födisch AG and DURAG GmbH, dated on 2009-03-14.
/TS/	Technical specification: 1. Secondary Catalyst in the ammonia reactor 2. All the stake monitoring equipments 3. Technical specification of ABB A02000 URAS 26 for analysing N₂O concentration.
/VCS PD/	VCS Project Description – “Catalytic Reduction of N ₂ O inside the Ammonia Burners of the Nitric Acid Plant in Caojing, Shangha”i - PD Version 3, 24 th June 2010.
/VCS-VAL/	VCS Validation Report from TÜV NORD CERT GmbH – “Catalytic Reduction of N ₂ O inside the Ammonia Burners of the Nitric Acid Plant in Caojing, Shangha”i - Report

Reference	Document
	No: 8000372692-09/208, 20 th June 2010 (rev 1 from 11 th November 2010).
/VER HB/	VER-Handbook, v1, VER-Handbook, Version 2.1 December 2011 VER-Handbook, Version 3 2. März 2012 (Documentation of the monitoring procedures, monitoring plan and their implementation).
/XLS/	Emission reduction excel calculation spreadsheets v1 Emission reduction excel calculation spreadsheets final

Table 6-2: Background investigation and assessment documents

Reference	Document
/AM0034/	Approved CDM Methodology AM0034 /Version 03.2 “Catalytic reduction of N ₂ O inside the ammonia burner of nitric acid plants”
/AM0028/	Approved CDM Methodology AM0028, Version 4.1: “Catalytic N ₂ O destruction in the tail gas of Nitric Acid or Caprolactam Production Plants”
/CPM/	TÜV NORD JI / CDM CP Manual (incl. CP procedures and forms)
/ESPI/	Emission Standard of Pollutants for Nitric Acid Industry
/EN14181/	EN DIN 14181: Quality assurance of automated measuring systems
/IPPC/	1. 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book 2. 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book
/VCS/	Voluntary Carbon Standard 3.0

Reference	Document
/VVM/	Validation and Verification Manual (Version 1.2)

Table 6-3: Websites used

Reference	Link	Organisation
/cd4cdm/	www.cd4cdm.org	UNEP Riso Centre
/ipcc/	www.ipcc-nggip.iges.or.jp	IPCC publications
/vcs/	www.v-c-s.org	VCSA
/unfccc/	http://cdm.unfccc.int	UNFCCC

Table 6-4: List of interviewed persons

Reference	Mol ¹		Name	Organisation
/IM01/	V	☒ Mr. ☐ Ms	Leo Liu	Shanghai BASF Polyurethane Co. Ltd/ Plant Manager
/IM01/	V	☐ Mr. ☒ Ms.	Karolina Zhang	Shanghai BASF Polyurethane Co. Ltd/ Process Engineer
/IM01/	V	☒ Mr. ☐ Ms.	Li Qiang	Shanghai BASF Polyurethane Co. Ltd/ Instrument Engineer
/IM01/	V	☒ Mr. ☐ Ms.	Markus Wiehe	BASF/ Business Development Green House Gas Projects
/IM02/	V	☒ Mr.	Daniel Scholz	FutureCamp Climate GmbH/ Emission Trading & Climate Projects

Reference	Moi ¹		Name	Organisation
		☐ Ms.		

¹) Means of Interview: (Telephone, E-Mail, Visit)