



VERIFICATION REPORT

- VOLUNTARY CARBON STANDARD (V.1) -

PAPOP RENEWABLE CO., LTD

**“WASTEWATER TREATMENT WITH BIOGAS
PRODUCTION (UASB) AND HEAT UTILIZATION AT
GENERAL STARCH CO. LTD.”**

Verification Period
2004-01-01 to 2007-05-31
(Including both days)

Report No: 8000349679-07/63 - V01

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Date: 2007-August-31

Date of recommendation: 2007-08-31	Report No.: 8000349679-07/63-V01
Approved by: Mr. E. Krupp	Organisational unit: TÜV NORD JI/CDM Certification Program
Client: South Pole Carbon Asset Management Ltd.	Client ref.: Mr. Ingo Puhl

Summary:

Project Title: "Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co. Ltd."

Project Participant(s): (1) Papop Renewable Co., Ltd (2) South Pole Carbon Asset Management Ltd.

Applied Standard: Voluntary Carbon Standard (version 01)

Monitoring period: 2004-01-01 to 2007-05-31

Type of Verification: ☒ Combined (no separate validation) ☐ Based on validated PDD

PDD: Version dt. 2007-06-19

Monitoring report: Draft version dt. 2007-06-22; final version dt. 2007-08-02

Methodological approach: ☒ Approved CDM Meth; ☐ Combined appr. Meths; ☐ Project specific Meth

Applied methodologies: AM0022.: "Avoided Wastewater and On-site Energy Use Emissions in the Industrial Sector" (Version 4)

"Tool to determine project emissions from flaring gases containing methane." (UNFCCC, EB 28, Annex 13)

Verification Opinion: The scope of this combined verification (without separate validation) covers the determination of voluntary greenhouse gas emission reductions generated by the above mentioned project. The verification is based on the above mentioned PDD and Monitoring report, emission reduction calculation spreadsheet and supporting documents made available to the TÜV NORD JI/CDM CP by the project participants.

TÜV NORD JI/CDM CP herewith confirms that the verification has been carried out in accordance with the requirements of the VCS 1 esp. w.r. t. transparency (as per para. 2.7) and meets the requirements of the Voluntary Carbon Standard Verification Protocol.

As a result of the verification, the verifier confirms that:

- The project activity is in line with all applicable criteria of the VCS version 01.
- all operations of the project are implemented and installed as planned and described in the project design document. The monitoring system is in place and functional. The installed equipment essential for generating emission reductions runs reliable and is calibrated appropriately.
- the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner.

The project has achieved emission reductions in line with the requirements of the VCS 1 in the above mentioned monitoring period as below:

Emission reductions:	CO ₂ [t CO ₂]	CH ₄ [t CH ₄]	N ₂ O [t N ₂ O]	HFCs [t HFC]	PFCs [t PFC]	SF ₆ [t SF ₆]	Sum [t CO ₂ e]
2004	15,653	-	-	-	-	-	15,653
2005	20,229	-	-	-	-	-	20,229
2006	91,885	-	-	-	-	-	91,885
2007	38,152	-	-	-	-	-	38,152
TOTAL:	165,918	-	-	-	-	-	165,918

Work carried out by:

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Martin Saalmann
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Date of this revision	Rev. No.	Number of pages
2007-08-31	0	54

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Abbreviations

API	American Petroleum Institute
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CH₄	Methane
CO₂	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
Concl.	Conclusion
CR	Clarification Request
DOE	Designated Operational Entity
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
HFO	Heavy Fuel Oil
ISO	International Standardisation Organisation
MP	Monitoring Plan
MR	Monitoring Report
NCV	Net Calorific Value
Nm³	Normal Cubic Meter
PDD	Project Design Document
PP	Project Participant
QA/QC	Quality Assurance / Quality Control
TPD	Tonnes Per Day
Ref.	Reference
UNFCCC	United Nations Framework Convention on Climate Change
UASB	Upflow Anaerobic Sludge Blanket
VCS	Voluntary Carbon Standard
VCU	Voluntary Carbon Unit
VER	Voluntary Emission Reduction

	Page
Table of Contents	
1 Introduction.....	5
1.1. Objective.....	5
1.2. Scope	6
1.3. GHG Project Description	6
1.3.1 Project Scope	6
1.3.2 Project Entities	6
1.3.3 Project Location	7
1.3.4 Technical Project Description	7
2 Verification Team.....	9
3 Methodology	10
3.1. Verification Protocol.....	10
3.2. Review of Documentation.....	11
3.3. Verification audit planning.....	11
3.4. On-site assessment.....	12
3.5. Resolution of Forward and Corrective Action Requests	13
4 Verification Findings	15
4.1 Deviations from applied methodology.....	16
4.2 Assessment of conservative estimation of emission reduction	20
5 Emission Reductions	20
6 Verification Opinion	21
7 References	22
8 Verification Protocol	28

1 INTRODUCTION

South Pole Carbon Asset Management Ltd. has commissioned the TÜV NORD JI/CDM Certification Program (formally UNFCCC accredited DOE) to carry out the verification of the project:

"Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co. Ltd."

with regard to the relevant requirements of the Voluntary Carbon Standard Version 01 (VCS)^{/VCS/}.

For this project activity the combined verification approach, i.e. verification without separate validation, was followed. Within the scope of this engagement the verification team has reviewed the complete project documentation (Project Design Document^{/PDD/}, Monitoring Report^{/MR/}, emission reduction calculation and supporting documents) against the criteria of the VCS.

For this voluntary project activity the approved CDM methodology AM0022 (Ver. 4) was applied.

GHG data for the monitoring period covering 2004-01-01 to 2007-05-31 was verified in detailed manner applying the set of requirements, audit practices and principles as required under the verification standard.

This report presents the findings and conclusions of the verification assessment of this voluntary emission reduction project.

1.1. Objective

The purpose of this combined verification, by independent checking of objective evidence, is as follows:

- to assess the project design, in particular the project's baseline, the monitoring plan (MP), and the project's compliance with the applicable criteria of the VCS.
- to assess the project's compliance with other relevant rules, including the host country (Thailand) legislation.
- to verify that the project is implemented as described in the project design document;
- to confirm that the monitoring system is implemented and fully functional to generate voluntary emission reductions (VERs / VCUs¹) without any double counting; and

¹ As per VCS, Verified Emission Reductions (VERs) are considered to be VCUs only after successful registration in an approved VCU Registry.

- 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

The verification of this GHG off-set project is based on the project design document ^{/PDD/}, the monitoring report ^{/MR/}, emission reduction calculation spread sheet ^{/XLS/}, supporting documents made available to the verifier and information collected through performing interviews 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. GHG Project Description

1.3.1 Project Scope

The considered GHG project can be classified as a VER project in the sector given in Table 1-1 (according to the VCS list of eligible scopes and the list of Sectoral Scopes of UNFCCC).

Table 1-1: Project Scope(s)

Scope definition	Scope No.	Scope description
VCS	7	Fugitive emissions capture/recovery
UNFCCC	13	Waste handling and disposal

1.3.2 Project Entities

The list of the project entities involved in the project activity is given in table 1-2 below:

Table 1-2: Project Entities

Role	Name / Address	Contact person
Project Participant # 1:	Papop Renewable Co., Ltd 10/35, Soi Songseangtawan Ladphrao Rd, Samsennok Huaykwang Bangkok, 10320 Thailand	Prayut Vitthayanukorn Executive Director Tel: +66 44 446 111 E-mail: prayut@gsl-th.com
Project Participant	South Pole Carbon Asset Management Ltd.	Ingo Puhl Managing Partner

# 2:	Technoparkstrasse 1 8005 Zürich; Switzerland	Mobile +66 86 778 2869 E-mail: i.puhl@southpolecarbon.com
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1.3.3 Project Location

The project site is located within the territory of Khonburi, Nakorn Ratchasima Province, Thailand. The details of the project location are given in table 1-3:

Table 1-3: Project Location

No.	Project Scope
Host Country	Thailand
Region:	Nakhon Ratchasima
Project location address:	No. 99, Chock Chai – Khonburi Road, Amphur Kornburi, Nakhon Ratchasima.

1.3.4 Technical Project Description

The project site is a 600 TPD (tonnes per day) tapioca based starch manufacturing plant owned by M/s General Starch Co. Ltd. The generated process wastewater of 5000 m³/day splits into two streams: one stream of approx 4000 m³/day gets partially treated through a wastewater treatment facility (project activity waste water treatment plant) before entering into existing lagoon based wastewater treatment facility and another stream of balance flow was being bypassed to the same lagoon system (during 2004 - 2005, ie, when only UASB 1 was operating). The existing lagoon based wastewater treatment facility consists of approximately 34 lagoons of 16 hectares of coverage area.

The project plant (part of the project site) is a wastewater treatment facility based on the Upflow Anaerobic Sludge Blanket (UASB) technology provided and operated by M/s PAPOP. The organic wastewater of the tapioca starch plant is treated in two parallel UASB reactors (UASB 1 and UASB 2) and the generated biogas is flared and converted into heat for on-site usage. The biogas is not used for onsite electricity generation. The partially treated wastewater is discharged into an existing lagoon system (which is the pre-project treatment facility). The routes for the destruction of methane are:

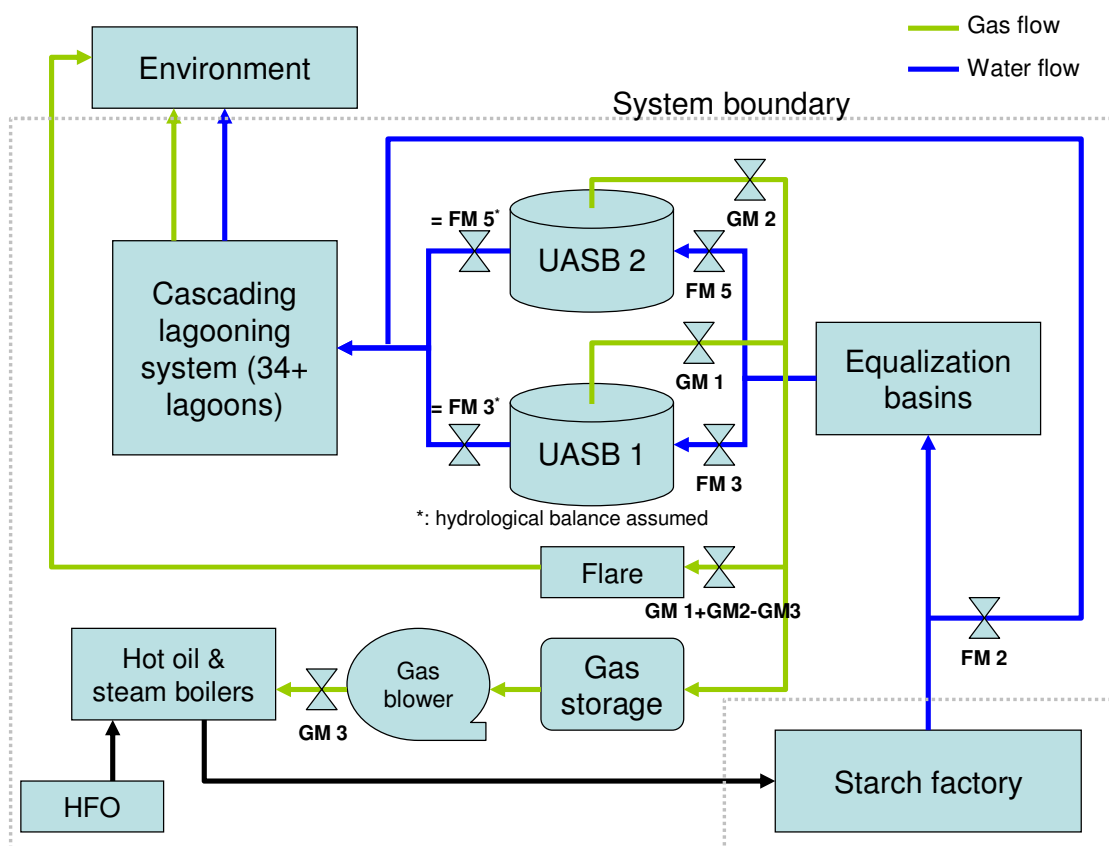
- Biogas flaring
- Biogas use in on-site heating facilities (5 hot oil generators and 1 steam boiler)

The project was implemented in phases:

- the first phase of the project (UASB 1) started in 2003 with start up of operations in January 2004; and

- the second phase of the project (UASB 2) started in 2005 with start up of operations in January of 2006. The Second phase includes operations of UASB 1 and UASB 2.

The process flow diagram of the project activity is presented below:



2 VERIFICATION TEAM

The Verification team was led by

- **Asim Kumar Jana**, TÜV Nord - Mumbai, India. Mr. Jana, M.Tech (Env Engg), Dipl in Industrial Safety, is a TÜV-CERT Lead auditor for ISO 9001/14001 and OHSAS 18001. He is Head - CDM Certification for TÜV Nord India operation and holds energy auditorship from Bureau of Energy Efficiency of India. He is an appointed assessor for JI/CDM certification program of TÜV Nord.

For this verification he was assisted by:

- **Martin Saalman**, TÜV NORD CERT GmbH is an appointed JI/CDM Expert in the JI/CDM Certification Program of TÜV NORD. He has received extensive training in the CDM validation & verification process.
- **Pongrat Khamnungkit** is a member of TÜV NORD Thailand. He is an appointed ISO 9000, ISO 14000 and OHSAS 18000 senior auditor. He works as a trainee for the TÜV NORD JI/CDM Certification Program.

The final verification report is verified by:

- **Eric Krupp**. Mr. Krupp works at TÜV NORD an approved emission verifier within the European Emission Trading Scheme. Mr. Krupp is an authorized JI/CDM assessor and deputy head of the JI/CDM Certification Program of TÜV NORD.

3 METHODOLOGY

The verification of the project was carried out from June to August 2007 after the contract dated 11/05/2007.

Preparations: *From 2007-06-11 to 2007-08-14*

On-site verification: *2007-06-19*

(Draft) Reporting: *2007-06-21*

(Final) Reporting: *From 2007-06-22 to 2007-08-31*

The combined verification consisted of the following steps:

- A desk review of the PDD^{/PDD/} (incl. annexes) and supporting documents with the use of the relevant sections of a customised protocol according to the VCS;
- A desk review of the Monitoring Report ^{/MR/}, the emission reduction calculation spreadsheet ^{/XLS/}, and additional supporting documents which were submitted by the client. The relevant sections of the above mentioned customised protocol according to the VCS were used.
- Verification audit planning,
- On-Site assessment,
- Background investigation and follow-up interviews with personnel of the project developer,
- Verification reporting (Draft Verification Report and Final Verification Report).

The criteria of this verification include the relevant rules and steps as set out in the VCS.

3.1. Verification Protocol

In order to ensure transparency and consideration of all relevant assessment criteria, a verification protocol was used. The protocol shows, in a transparent manner, criteria and requirements, means and results of verification. The verification protocol serves the following purposes:

- It organises, details and clarifies the requirements a VCS project is expected to meet;

- It ensures a transparent verification process where the verifying entity will document how a particular requirement has been proved and the result of the verification.

The completed verification protocol is enclosed in the annex to this report.

3.2. Review of Documentation

The following documents and records were considered in the course of this combined verification:

- the Project Design Document (draft and final version),
- the Monitoring Report (draft and final version) including the claimed emission reductions for the project,
- the emission reduction calculation,
- supporting documents provided by the client (such as technical drawings, manuals of equipment suppliers, performance records, meter readings, installation and calibration documents, business data etc.)
- records of the site visit (such as meter readings, interview memos etc.)
- information made available by any 3rd party (such as host country legislation, technical reports, published generation data etc.)

3.3. Verification audit planning

On the basis of the document review results the verification audit / on-site assessment was planned. The planning involves:

- Identification and assessment of material risks for the verification,
- Identification of issues to be covered during the on-site visit,
- Identification of documentation to be provided by the project developer,
- Detailed audit planning w.r.t. personnel resources, time schedule, travel arrangements,
- Drafting of the audit plan.

Material risks have been identified and classified acc. to the categories defined in the VCS. For details pl. refer to table 3-1.

Table 3-1: Material verification risks

Risk category	Identified Risk	Verifiers action
High risk (> 5 %)	Data source not compliant with the defined project boundary.	Data traceability check, Checking of original meter readings, Cross-check with own meter readings
	Exchange of monitoring	Identification of each

Risk category	Identified Risk	Verifiers action
	equipment	instrument
	Incomplete documentation	Application of appropriate discounts
Moderate risk (< 5 %)	Negligence of internal consumption and transmission losses	Identification of own consumption and transmission losses.
Low risk (< 1 %)	Data uncertainty of measuring equipment	Check of instrument specifications, Check of calibration records
	Lack of metering equipment calibration	Check of calibration records.

It has to be mentioned that data used for emission reduction calculation that has been derived from approved methodologies, published IPCC values or any other data that have been published by official organisations has not been accounted for with regard to quantification of verification risks.

3.4. On-site assessment

The assessment performed during the verification enabled the verifier to arrive at a conclusion regarding the readiness of the project to generate high quality emission reductions. As such, it was indispensable to carry out an inspection on site in order to verify that the project is implemented in accordance with the applicable criteria. Furthermore the on-site assessment is necessary to check the monitoring data with respect to accuracy to ensure the calculation of emission reductions.

- 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.
- Metering equipment was checked and positions of counters were recorded in order to prepare for the next periodic verification.
- The on-site assessment included an investigation whether all metering equipment was duly calibrated.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked via spot sample on the level of the meter recordings.

On 2007-06-19 and on 2007-06-22 the verification team of TÜV NORD JI/CDM CP performed interviews with project participants to confirm selected information and to resolve issues identified in the document review.

Representatives of the project participant and operational staff of the plant were interviewed. The main topics of the interviews and key interviewees are summarised in Table 3-1.

Table 3-1: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
Mr. I. Puhl <i>South Pole</i> Mr. P. Vitthayanukorn, <i>Papop Co., Ltd.</i> Mr. S. Prathong <i>Papop Co., Ltd.</i> Mr. M. Uthaiphatrakul <i>Papop Co., Ltd.</i> Ms. Chananya <i>Papop Co., Ltd.</i>	- General aspects of the project - Technical equipment and operation - Project design and implementation - Public funding - Project additionality - Project starting date - Project performance - Involved personnel and responsibilities - Monitoring and measurement equipment - Monitoring data - Downtimes and equipment failures - Exchange of monitoring equipment - Data uncertainty and residual risks - Business data - GHG calculation - Training and practice of the operational personnel - Editorial aspects of the monitoring report

3.5. Resolution of Forward and Corrective Action Requests

Nonconformities raised during the verification can either be seen as a non-fulfilment of criteria ensuring the proper implementation of a project or where a risk to deliver high quality emission reductions is identified.

Corrective Action Requests (CARs) are issued, if:

- mistakes have been made in assumptions or the project documentation which directly will influence the project results,
- the eligibility requirements for VCU projects have not been met
- there is a clear deviation concerning to the applicable verification criteria.
- requirements set by the monitoring plan have not been met; or
- mistakes in the emission reduction calculation have been detected.

Forward Action Requests (FAR) indicates essential risks for further periodic verifications. Forward Action Requests are issued, where:

- the actual status requires a special focus on this item for the next consecutive verification, or
- an adjustment of the monitoring plan is recommended.

The verification team may also use the term Clarification Request (CR), which would be issued if:

- additional information is needed to fully clarify an issue.

The identified risks are reported in the form of CAR and CR in the Draft Verification Report (DVR). Based on the response provided against the CAR and CR reported in the DVR and the revised PDD and MR, the Final Verification Report (FVR) containing the verification opinion is issued.

4 VERIFICATION FINDINGS

In the following tables and paragraphs the findings from the desk review of the monitoring report ^{/MR/}, the PDD ^{/PDD/} and other supporting documents, as well as from the on-site assessment and the interviews are summarised.

The summary of CAR, FAR and CR issued are shown in Table 4-1:

Table 4-1: Summary of CAR and CR

#	Verification topic	No. of CAR	No. of CR	No. of FAR
#1	Project category	0	0	
#2	Geographic location	0	0	
#3	Eligible GHGs	0	0	
#4	Project Start Date	0	0	
#5	Emission Reduction Start Date	0	0	
#6	Public funding and grants	0	0	
#7	Project boundary / GHG assessment boundary	0	0	
#8	Calculation Methodology	0	0	
#9	Secondary Effects	0	0	
#10	Project Additionality	0	0	
#11	Quality of reductions	0	0	
#12	Monitoring Process	4	4	1
#13 ²	General topics	0	0	
	SUM	4	4	1

For an in depth evaluation of all combined verification items it should be referred to the validation protocol (Annex). Annex also includes all CARs, CRs and FARs (Table 2).

² Not included in the official VCU Verification Criteria list

4.1 Deviations from applied methodology

A set of key data, variables and monitoring parameters, which are included the Project Design Document, Monitoring Report and calculation sheet, are found deviated (or adjusted) from (with) applied methodology and the flaring tool. These deviations have been assessed under the provisions of AM0022 and flaring tool for their appropriateness and correctness in calculating total emission reduction generated by the project activity. The same is summarised in the table 4-2 below.

Table 4-2: Summary of Deviations and Adjustments

Data/Parameters/ Variables	Reference of AM0022 and Flaring Tool	Deviations or Adjustments	Consideration by Assessment Team
EF_{CH_4} (kg CH ₄ /kg COD)	Meth Pg # 3, Eq # (2)	As the tapioca starch wastewater contains polysaccharides, the different from default emission factor, ie, 0.21 can be applied. The project specific applied value is 0.241.	The theoretical value of methane conversion factor is 0.25. Applying the formula presented in the B.6.2 and Annex-3 of PDD and the actual data log of 2006 (12 months), the project specific value is correctly calculated as 0.241 kg CH ₄ /kg COD. The same is applied as fixed for the entire monitoring period.
$E_{CH_4_NAWTF}$ (tCO _{2e})	Meth Pg #2, Pg # 5, Eq # (1)	Zero value is applied in absence of project specific data.	As registered CDM project no 1040 "Korat waste to energy" being on tapioca starch wastewater project plant (located 50 KM away to this project site) considers this factor as zero, the registered PDD serves as documentary evidence (in absence of project specific measurements, technology supplier data, expert estimate) for neglecting this parameter.
$M_{lagoon_chemical_ox}$ (kg COD)	Meth Pg # 3, # 32, Eq # (3), Appendix -2	Zero value is applied.	The test reports of wastewater confirm that sulphate (oxidative

Data/Parameters/ Variables	Reference of AM0022 and Flaring Tool	Deviations or Adjustments	Consideration by Assessment Team
			species) concentration is not detectable. Hence the parameter can be considered as zero.
R_{lagoon} (ratio)	Meth Pg #4, Eq # (5), Appendix 2	87.88 % in absence of pre-project series of test as per Appendix 2	Value of CDM project no 1040 "Korat waste to energy" is applied in absence of pre-project series of test as per Appendix 2 of AM0022. This is a realistic value as the "Korat waste to energy" project is of comparable in nature.
R_{NAWTF} (ratio)	Meth Pg #4, Eq # (4)	95.92 % in absence of both the options in hierarchy, ie, pilot plant study before the project implementation and estimates by manufacturer.	Based on the actual operational data of representative period 16 months period covering monitored COD in and out for UASB1 and UASB2 in 2006, plus Jan to April of 2007 (ref B.6.2 of the PDD). The applied value is OK.
$R_{\text{deposition}}$ (ratio)	Meth Pg #4, Eq # (6), Appendix 3	Zero value is applied in absence of project specific data.	Value of CDM project no 1040 "Korat waste to energy" is applied in absence of pre-project sampling based analysis as per Appendix 3 of AM0022. This is a realistic value as the "Korat waste to energy" project is of comparable in nature.
$M_{\text{lagoon_input}}$ (kg of COD)	Meth Pg #4, Eq # (5), Pg # 19 (parameter #16)	As 100 % wastewater is not being treated by the project plant during 2004-2005, the $M_{\text{lagoon_input}}$ is equated with $M_{\text{lagoon_input}} + M_{\text{lagoonp- input- bypass}}$ for this project activity.	As monitoring parameter # 16 of page 19 of AM0022 identifies this bypass parameter, this substitution is appropriate for 2004 - 2005. The bypass water quantity during 2004 -

Data/Parameters/ Variables	Reference of AM0022 and Flaring Tool	Deviations or Adjustments	Consideration by Assessment Team
			2005 is calculated using water balance approach using bench mark value of specific consumption of water use per kg root, ie, 2.52 l/kg of root and measured data of water input (= water output) from UASB1. This approach of calculation is OK. The basic data and calculation presented in the PDD and MR were verified and found OK.
Biogas Methane Concentration (% by Vol)	Meth monitoring parameter # 11 (pg 18) Flaring Tool pg 9	65% by volume throughout the monitoring period in absence of continuously monitored data.	The application of this fixed value of methane concentration is conservative compared to actual value measured on balloon samples by an independent laboratory. Moreover, the same vol% value can be considered as dry basis in applying flaring tool for PE_{flare} calculation (Cp Eq 7 of AM0022).
$E_{CH4-leaks}$ (tCO _{2e})	Meth pg 5	Zero in absence of project specific measurement.	Value of CDM project no 1040 "Korat waste to energy" is applied in absence of project specific data on bio-reactor leak as per pg 5 of AM0022. This is a realistic value as the "Korat waste to energy" project is of comparable in nature. As the delivery pipeline (confirming to API standard) is less than 2 km in length, the pipeline leakage can be considered as zero.

Data/Parameters/ Variables	Reference of AM0022 and Flaring Tool	Deviations or Adjustments	Consideration by Assessment Team
$PE_{\text{flare,y}}, \eta_{\text{flare,h}}$	Flare Tool (Eq No 15)	As the flare is of open type and the temperature is 850°C for more than 40 minutes during the hour h, the 50% default is selected. Considering that the volumetric flow of gas to the flare is not measured directly and other parameter are not measured on an hourly basis, the figures in these equations are based on hourly averages using annual reported data and using the simplifications and default values provided by the flaring tool.	The selection of default value of efficiency of the open flare is OK. The hourly averaging of annual figures of volumetric flow of gas to the flare can be considered as an adjusted value.
F, NCV	Meth Pg #11, Eq # (9), Pg # 17 (parameter #8)	Based on the approach given under Pg # 17 (parameter #8) of AM0022 the amount of heavy fuel oil is calculated from energy equivalent approach. 1m3 biogas = 0.0005743 tons of heavy fuel oil In establishing this relationship, 65% by Vol methane in biogas and IPCC 2006 NCV value of heavy fuel oil is considered in absence of site specific local NCV value.	The approach and calculation is accurate.
Biogas sent to flare (Nm ³)	Meth Pg # 17 (parameter #9)	Calculated in place of measured.	Difference of two direct gas flow meter readings can be considered as good as measured.
Biogas production data		Calculation of gas production data for 113 days in 2004 and 73 days in 2005 from COD load information and average gas production per unit of	The approach of compensation of missing data can be considered as an adjusted value.

Data/Parameters/ Variables	Reference of AM0022 and Flaring Tool	Deviations or Adjustments	Consideration by Assessment Team
		COD load to compensate for a broken gas meter that did not provide meter readings on those days.	

4.2 Assessment of conservative estimation of emission reduction

In accordance with the methodology equation (13) the conservative calculation of emission reduction is carried out. The +ve difference of $E_{CH_4_lagoon_BL}$ and $\sum E_{CH_4_lagoon} + E_{CH_4_coll}$ is deducted from the E_R value obtained through equation (12) for 2004 and 2005 periods.

5 EMISSION REDUCTIONS

The VCS ver. 1 requires an annual GHG related breakdown of emission reductions. The following results have been verified (table 5-1).

Table 5-1: Emission reductions

Emission reductions:	CO ₂ [t CO ₂]	CH ₄ [t CH ₄]	N ₂ O [t N ₂ O]	HFCs [t HFC]	PFCs [t PFC]	SF ₆ [t SF ₆]	Sum [t CO ₂ e]
2004	15,653	-	-	-	-	-	15,653
2005	20,229	-	-	-	-	-	20,229
2006	91,885	-	-	-	-	-	91,885
2007	38,152	-	-	-	-	-	38,152
TOTAL:	165,918	-	-	-	-	-	165,918

6 VERIFICATION OPINION

The scope of this combined verification (without separate validation) covers the determination of voluntary greenhouse gas emission reductions generated by the above mentioned project. The verification is based on the submitted PDD and Monitoring report, emission reduction calculation spreadsheet and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant.

TÜV NORD JI/CDM CP herewith confirms that the verification has been carried out in accordance with the requirements of the VCS 1 esp. w.r.t. transparency (as per para. 2.7) and meets the requirements of the Voluntary Carbon Standard Verification Protocol.

As a result of the verification, the verifier confirms that:

- The project activity is in line with all applicable criteria of the VCS version 01.
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- The GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner.

The project has achieved emission reductions in line with the requirements of the VCS 1 in the monitoring period as stated in chapter 5.

Essen, 2007-08-31

A handwritten signature in blue ink, appearing to be "Eric Krupp".

Eric Krupp

TÜV NORD JI/CDM Certification Program
Verification Team Leader

7 REFERENCES

Table 7-1: Documents provided by the project proponent

Reference	Document
/CAL/	Calibration records for the key instruments and measuring devices: - Wastewater flow meters (FM 3 at the inlet of UASB1 and FM 5 at the inlet of UASB 2); - Biogas flow meters (GM1 on delivery line of UASB1, GM2 on the delivery line of UASB2, GM3 at the common inlet of burner of hot oil and steam boilers); - HFO meters (at the inlet of the burners); and - Biogas methane analyser (IR spectrometer) for methane concentration in %, tCH₄/ Nm³ on wet basis (Ref parameter # 11, pg 18 and equation no 7, pg 5 of AM 0022). Correlation graph of biogas calorific value (parameter # 19 of pg 19 of AM 0022)
/ BLS/	Methodology and project specific baseline study related evidences: - Proof of inlet wastewater chromatistics w.r.t type of sugar compounds and COD (test report from an reputed laboratory) - Average depth of lagoon system and total pond surface area in hectare - Extract of testing of pre-project specific factors: R_{lagoon} (ref equation 5 of AM 0022) ; M_{lagoon_deposition} (ref equation 6 and testing methodology under APPENDIX 3 of AM 0022) ; - Specific fuel consumption (HFO in energy unit/ dry starch quantity) from 3 yrs historical data (ref equation 9 of AM 0022) for the burners - NCV and density of the HFO from the fuel supplier (Ref equation 9 of AM 0022). - Residual lifetime of the hot oil and steam boilers. - Combustion efficiency of burner (on HFO) for hot oil and steam generator. - Requirement of heat and electricity per quantity of wastewater input to lagoon.
/TS- PRJ/	Technical data/ document related to the project plant::

Reference	Document
	- Requirement of heat and electricity per quantity of wastewater input to UASB. - Plant layout drawing showing the major equipment and their interconnection - Process Flow diagram indicating sampling point and field instruments. - Hydraulic and COD mass balance sheet or diagram - Technical data sheets specifying capacity of UASB reactor (make: PAPOP) ; Flare; Burner (with co-firing provision) - Performance or commission reports of Burner (with co-firing provision). - Combustion efficiency of burners (on Biogas and HFO) of 5 hot oil and 1 steam boilers - Proportion of methane destroyed by Burner (with co-firing provision)
/LOG/	Extract of log of monitored data of the project activity: - Covering the parameters associated with water volume, gas volume (generated and burnt), COD concentration, gas concentration taking into account of monitoring parameters ID no 1-5, 8 -12,16 of AM 0022 - Process water consumption (from separation section of process plant) covering the monitoring period - Annual reports stating the quantity of dry starch production; HFO consumption
/BL-ER/	Baseline and emission reduction estimation calculation spread sheets in accordance with the PDD.
/CON/	The signed contract between TÜV NORD and South Pole for carrying out verification of voluntary emission reduction.
/MD/	Management decision for VCS consideration
/MR/	1. Monitoring report dt 22.06.07 (draft) 2. Monitoring report dt 02.08.02 (final)

Reference	Document
/XCS/	Spread sheets of emission reduction calculation corresponding to MR1, MR 2. Calculation spread sheet in accordance with equations of AM0022 (covering entire verification period). Spread sheet for EF_{CH4} underlying value.
/PDD/	Project Design Document entitled "Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co. Ltd." Version 1 dated 19/06/2007.
/ORG/	Organizational chart
/SC/	Proof of statutory clearances for the project plant (pending)

Table 7-2: Background investigation and assessment documents

Reference	Document
/AM0022/	"Avoided Wastewater and On-site Energy Use Emissions in the Industrial Sector", Version 4, released by EB 28.
/AM0013/	"Avoided methane emissions from organic wastewater treatment", Version 4
/FT/	"Tool to determine project emissions from flaring gases containing methane", released by EB 28.
/CPM/	TÜV NORD JI / CDM CP Manual (incl. CP procedures and forms)
/GCP/	UNFCCC: Guidelines for completing CDM-PDD and CDM-NM
/REF-CDM/	UNFCCC registered CDM project entitled "Korat Waste to Energy" (Ref No 1040) using AM0022
/IPCC-GP/	IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2006
/IPCC-RM/	1. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual 2. IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2006

Reference	Document
/KP/	Kyoto Protocol (1997)
/MA/	Decision 17/CP. 7 (Marrakesh – Accords and Annex to decision 17/CP.7)
/VVM/	IETA, PCF Validation and Verification Manual (V. 4)
/VCS/	The Voluntary Carbon Standard, Verification Protocol and Criteria, Version 01

Table 7-3: Websites used

Reference	Link	Organisation
/dna-t/	www.onep.go.th/CDM/	Climate Change Coordination Unit serving as Thai DNA
/ipcc/	www.ipcc-nggip.iges.or.jp	IPCC publications
/unfccc/	http://cdm.unfccc.int	UNFCCC
/ieta/	www.ieta.org/	Website of International Emission trading Association (IETA)
/ghg/	www.ghgprotocol.org/templates/GHG5/layout.asp?MenuID=849	World Business Council for Sustainable Development
/papop/	www.papop.com	Web site of the technology supplier and project operator.

Table 7-4: List of interviewed persons

Reference	Mol ¹		Name	Organisation / Function
/IM01/	V	☒ Mr. ☐ Ms	Ingo Puhl	South Pole Carbon Asset Management Ltd.; Managing Partner
/IM02/	V	☒ Mr. ☐ Ms.	Suthep Prathong	Papop Co., Ltd. ; President
/IM02/	V	☒ Mr.	Prayut Vitthayanukorn	Papop Co., Ltd.; Executive

Reference	Mol ¹		Name	Organisation / Function
		☐ Ms.		Director
/IM03/	V	☒ Mr. ☐ Ms.	Mont Uthaiphattrakul	Papop Co., Ltd.; Deputy Managing Director
/IM03/	V	☐ Mr. ☒ Ms.	Chananya	Papop Co., Ltd.; Scientist

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

ANNEX

Verification Protocol (acc. to VCS 1.0)

8 VERIFICATION PROTOCOL

Table 1: Validation/ Verification Minimum Criterion Checklist (Revision date 2007-06-05)
(Customized based on VCS version 01³ and the applicable CDM criterion⁴ at the time of PDD/MR submission)

Criterion/ checklist points	Description of Minimum Criterion	Ref.	Comments	Draft/ final Concl.
#1: Project Category	<u>Criterion:</u> Emission reduction project types eligible under the VCU Verification Criteria are listed below, divided into categories for the benefit of project developers and certification entities: 1. Renewable energy [wind, PV, solar thermal, biomass, liquid biofuels, geothermal, run-of-river hydro] 2. Industrial energy efficiency 3. End-use energy efficiency 4. Fuel switch from fossil to fossil or non-agricultural waste gas 5. Waste gas capture and destruction (recovery) from non-agricultural industrial processes (N₂O, HFCs, PFCs, SF₆) 6. Waste gas capture from municipal waste and municipal wastewater treatment (CH₄ & N₂O) 7. Fugitive emissions capture/recovery		<u>Verifier's Action:</u> Verification Entity shall verify that the Project directly avoids or displaces greenhouse gas emissions from an Endorsed Project Category and shall clearly state in the Verification Report which project category the reduction belongs to.	
1.1	Is the eligibility of the project category and the discussion and determination of the project category transparent?	/PDD/ A.2	The project activity is a wastewater treatment project generating biogas using decomposition of wastewater of a tapioca starch facility. Thus it clearly qualifies for the following marked eligible project category: ☐ Renewable energy [wind, PV, solar thermal, biomass, liquid biofuels, geothermal, run-of-river hydro]	OK

³ www.ieta.org

⁴ http://cdm.unfccc.int

			☐ Industrial energy efficiency ☐ End-use energy efficiency ☐ Fuel switch from fossil to fossil or non-agricultural waste gas ☐ Waste gas capture and destruction (recovery) from non-agricultural industrial processes (N ₂ O, HFCs, PFCs, SF ₆) ☐ Waste gas capture from municipal waste and municipal wastewater treatment (CH ₄ & N ₂ O) ☒ Fugitive emissions capture/recovery	
1.2	Does the project consist of several sub project activities which meet the VCS Verification Criteria?	/PDD/ /VCS-I/	The project does not comprise of several sub-bundles. The project consists of installation of a UASB reactor which generates biogas out of wastewater from starch processing factory. The methane is flared and used for heat generation. The biogas reactor, the flare and the heat generator are clearly a part of a single project as to AM0022. There is no double counting of emission reductions.	OK
#2: Geographic Location	Criterion: The VCU Verification Criteria recognizes projects from any geographic location.		Verifier's Action: Verification Entity shall verify, through site visits that at the stated geographic location there are working physical components, installed facility and emission reduction monitoring equipment corresponding to the actual Project disclosed in the project documents made available to the Verification Entity. <i>In the Verification Report, the Verification Entity shall include documented evidence of a site visit confirming existence of the stated Project at the stated location.</i>	

2.1	Are the project location and it's spatial boundaries (geographical) clearly defined.	/PDD/ A.4.	The details of the project location are given in the following table: <table><tr><th>Parameter</th><th>Value</th></tr><tr><td>Host country</td><td>Thailand</td></tr><tr><td>Region</td><td>Nakhon Ratchasima</td></tr><tr><td>Project location address</td><td>No. 99, Chock Chai – Khonburi Road, Amphur Kornburi, Nakhon Ratchasima.</td></tr></table> The project's spatial and system boundaries are clearly defined. The project encompasses the wastewater lagoon system, the UASB reactor, the biogas pipelines, the flare and the hot oil and steam generators.	Parameter	Value	Host country	Thailand	Region	Nakhon Ratchasima	Project location address	No. 99, Chock Chai – Khonburi Road, Amphur Kornburi, Nakhon Ratchasima.	OK
Parameter	Value											
Host country	Thailand											
Region	Nakhon Ratchasima											
Project location address	No. 99, Chock Chai – Khonburi Road, Amphur Kornburi, Nakhon Ratchasima.											
2.2	Has a site visit been carried out?		A site visit was carried out on 2007-06-19 by Mr. Jana, Mr. Saalmann, Mr. Khamnungkit.	OK								
2.3	Has the project been implemented as planned and described in the PDD?	/PDD/ /LOG/ /MR/	As per the monitoring log UASB 01 was commissioned on 2004-01-01 and gas-firing for hot oil and steam generation was started on 2004-04-25. In between the reactor was under stabilization phase. UASB 02 was commissioned on 2006-01-01 and gas-firing for hot oil and steam generation was started on 2006-02-11. In between the reactor was under stabilization phase. On and from 2006-02-11 the gas generated from USAB 01 and 02 was combusted together for hot utility generation. Since 2006-02-11 the flaring system is also installed and in operation. However from 2004-04-25 onwards dual fuel (biogas and HFO) firing took place to	Depends on the closure of the CAR and CR issued in the monitoring section								

			meet the hot utility demand of the process plant. Nevertheless the monitoring since the implementation of the project has not happened in complete manner as per methodology AM0022 and PDD. In this context several CAR and CR has been raised under the section of monitoring.	#																					
#3: Eligible GHGs	Criterion: The VCU Verification Criteria acknowledges emission reduction projects involving any of the six greenhouse gases currently included in the Kyoto Protocol.		Verifier's Action: Verification Entity shall verify that the Project Activity contributes to reductions in the emissions of one or more of the following six Kyoto Protocol greenhouse gases: 1. Carbon dioxide (CO2); 2. Methane (CH4); 3. Nitrous oxide (N2O); 4. Hydrofluorocarbons (HFCs); 5. Perflourcarbons (PFCs); 6. Sulphur hexafluoride (SF6). In the Verification Report, the Verification Entity shall state the volume of emission reductions for each of the six greenhouse gases separately. The Verification Entity shall further verify and state that the current IPCC published GWP factor has been used for non-CO2 gases.																						
3.1	Are all relevant GHG considered for the project activity?	/PDD/ /VCS/ /GHG/	The following marked GHG gases are considered for this project acitivity: <table border="1"><thead><tr><th></th><th>GHG</th><th>GWP</th></tr></thead><tbody><tr><td>☒</td><td>Carbon dioxide (CO2)</td><td>1</td></tr><tr><td>☒</td><td>Methane (CH4)</td><td>21</td></tr><tr><td>☐</td><td>Nitrous oxide (N2O)</td><td>-</td></tr><tr><td>☐</td><td>Hydrofluorocarbons (HFCs)</td><td>-</td></tr><tr><td>☐</td><td>Perflourcarbons (PFCs)</td><td>-</td></tr><tr><td>☐</td><td>Sulphur hexafluoride (SF6)</td><td>-</td></tr></tbody></table> Here, CO2 and CH4 as GHG have been considered as per AM0022.		GHG	GWP	☒	Carbon dioxide (CO2)	1	☒	Methane (CH4)	21	☐	Nitrous oxide (N2O)	-	☐	Hydrofluorocarbons (HFCs)	-	☐	Perflourcarbons (PFCs)	-	☐	Sulphur hexafluoride (SF6)	-	OK
	GHG	GWP																							
☒	Carbon dioxide (CO2)	1																							
☒	Methane (CH4)	21																							
☐	Nitrous oxide (N2O)	-																							
☐	Hydrofluorocarbons (HFCs)	-																							
☐	Perflourcarbons (PFCs)	-																							
☐	Sulphur hexafluoride (SF6)	-																							

3.2	Have the current IPCC GWP values been applied?	/ipcc/	Yes, the GWP value for CO ₂ and CH ₄ as stated in the table in 3.1 has been applied.	OK
#4: Project Start Date	Criterion: The VCU Verification Criteria acknowledges emission reduction projects that have started on or after January 1st, 2000.		Verifier's Action: Entity shall verify, through examination of company documents and records that the Start Date of the Project which generated the emission reductions was on or after January 1st 2000. Verification Entity shall also verify that completion of installation works does not contradict with the dates of generation of emission reductions in the monitoring report.	
4.1	Is the project's starting date clearly evidenced?	/PDD/ C.1.1 /LOG/	The project's starting date is 2004-01-01 which is evidenced from the log of the UASB 01 reactor.	OK
4.2	Is the expected operational lifetime clearly defined, reasonable and is the crediting period covered?	/PDD/ C.1.2 /TS-PRJ/	The operational lifetime is expected to be 21 (twenty one) years, this was assessed as reasonable. Furthermore a renewable crediting period of 7 years (acc. to the CDM rules) is chosen.	OK
4.3	Does the emission reduction starting date contradict with the project's starting date?	/PDD/ C.1.1 /LOG/	Yes, emission reductions started on and after the stated project starting date in PDD. Depends on the closure of CR 2. Please refer to the monitoring section.	CR 2
#5: Emission Reduction Start Date	Criterion: The VCU Verification Criteria acknowledges emission reductions which have been generated after January 1, 2000. The Standard acknowledges only existing emission reductions, i.e. reductions that have already happened		Verifier's Action: Verification Entity shall verify, through examination of company documents, records, and monitoring reports that the emission reductions occurred on or after January 1, 2000. In the Verification Report, the Verification Entity shall clearly state the volume of emission reductions generated in each calendar year separately.	

5.1	Has evidence been provided, that the emission reductions occurred on or after January 1 st 2000?	/PDD/ C.2.2.2 /LOG/	Yes, evidence was provided through the log sheets.	OK
#6: Public Funding and grants	Criterion: <i>The VCU Verification Criteria only accept projects where no public funding or official development assistance has been employed in the project activity or those elements of the project activity that lead to emissions reductions.</i> <i>Where public funding has been used in conjunction with commercial financing, only emissions reductions associated with that portion of the project that has been financed on purely commercial terms shall be eligible to be certified as VCUs.</i>		Verifier's Action: <i>Verification Entity shall verify and state in the Verification Report that the Project has not employed any Public Funding, grants or Official Development Assistance ("ODA") for construction or running operations in any of the geographic locations of the Project Activity.</i> <i>Where a combination of public and private funding has been employed the Verification Entity shall verify and state in the Verification report that VCUs have only been generated from that portion of the project that has been financed on purely commercial terms.</i> <i>Verification should be performed through examination of financial records, management interviews, and where necessary, interviews with representatives of the relevant entities or organizations providing development assistance in the respective project locations.</i>	
6.1	Does the project use any public funding, grants or official development assistance ("ODA") for construction or running operations in any of the geographic locations of the project activity?	/PDD/ Annex 2	No public funding is involved in the project activity.	OK
#7: Project Boundary/ GHG Assessment Boundary	Criterion: <i>The VCU Verification Criteria require that the project boundary shall encompass all anthropogenic emissions by sources of greenhouse gases (GHG) under the control of the project participants that are significant and reasonably attributable to the project activity.</i>		Verifier's Action: <i>Verification Entity shall verify and state in the Verification Report that the project boundary and GHG Assessment Boundary incorporates all primary effects and significant Secondary Effects, and that the requirements for defining the GHG assessment boundary (as defined in the GHG-PP) have been met.</i>	

			Verification Entity shall also make sure that the Project Boundary does not indirectly overlap with up- or downstream facilities. In particular, Verification Entity shall disallow any downstream energy efficiency projects in jurisdictions which have mandatory GHG emission caps on the electricity sector.	
7.1	Are the project's system (components and facilities used to mitigate GHG's) boundaries clearly defined?	/PDD/ (A.4.3.)	Yes, the projects system boundaries are explained under section A.4.3. of the PDD. This has also been verified during onsite interview.	OK
7.2	Does the project boundary and GHG Assessment Boundary incorporate all primary effects and significant secondary effects, as per the requirements for defining the GHG assessment boundary (as defined in the GHG-PP)?	/PDD/ /GHG/	Yes, the project boundary and GHG Assessment Boundary incorporate all primary effects and no significant secondary effects, as per the requirements for defining the GHG assessment boundary. The project belongs to the avoidance of fugitive emissions and no leakage emissions are envisaged as per AM0022.	OK
7.3	Has it been verified, that the project activity does not overlap with up- or downstream facilities in order to avoid double counting.	/PDD/ /GHG/	This is a captive biogas generation project along with heating utility generations. Thus there is no possibility of double counting by having overlap with other project boundaries.	OK
7.4	Is only one project boundary defined for all Project Activities in order to avoid double counting? (As per GHG Assessment Boundary is defined in Sec 2.5 and Chapter 5 of the GHG-PP?)	/PDD/ /GHG/	The project is a single project activity. No other projects are part of this project activity. Thus double counting of emission reductions is very unlikely regarding this issue.	OK
#8: Calculation Methodo- logy	Criterion: The VCU Verification Criteria requires that: A. Where possible, the project proponents shall use calculation methodologies that have been approved by the CDM Executive Board for determining emission reductions for the specific Project type. Where an existing approved calculation methodology is not applicable in its entirety, project proponents may use combinations of approved methodologies. B. In situations where an existing CDM Executive Board		Verifier's Action: A. Verification Entity shall verify and state in the Verification Report, if applicable, that the project proponent has used calculation methodologies that have been approved by the CDM Executive Board for estimating the volume of emissions reductions generated from the Project, and that those methodologies have been correctly and accurately applied in calculating the total emissions reductions generated by the respective Project. This includes, but is not limited to, stating in the Verification Report the following: • Identification of Baseline Candidates;	

	methodology is not available in its entirety or as a combination of existing approved methodologies, the project proponent shall clearly illustrate how the Project baseline was identified and emission reductions calculated. The proponent may use a performance standard or best practice approaches to determine the baseline emissions and calculating the emissions reductions, as described in the GHG -PP.		•Determination of a Baseline Scenario; •Definition and calculation of Baseline Emissions; •Definition and calculation of project emissions; and •Calculation of project emission reductions. In case the project has earlier been verified for delivery of VCUs, the Verification Entity shall point out differences in the baseline between the current and any earlier verifications. The baseline shall not remain fixed between two verification periods In such cases where the Calculation Methodology consists of a combination of approved methodologies, the Verification Entity shall clearly verify: •which approved methodologies have been used ;and, •methodologies have been used accurately and transparently in combination. B. If a CDM Executive Board approved methodology has not been used the Verification Entity shall verify and state in the Verification Report that the Project Activity has applied a methodology equivalent to the approved CDM methodology Verification Entity shall then verify and state in the Verification Report that the requirements, as defined by the GHG PP for the following criteria have been met: •It uses the Performance Standard approach to calculate the baseline emissions in the absence of the project activity; •All the appropriate Baseline Candidates have been identified and their GHG emissions rates drawn from public references; •An appropriate Stringency Level has been selected for the performance standard; •All Primary and Significant Secondary Effects have been incorporated into the project's GHG Assessment Boundary (see secondary effects criterion below); •The calculation of emission reductions is accurate and fairly stated.	
8.1	Is an approved CDM methodology or a combination of approved methodologies applied in the project activity? In case it is please provide name(s) and	/PDD/ /AM0022/ /AM0013/ /FT/	The approved CDM large-scale baseline and monitoring methodology AM0022 "Avoided Wastewater and On-site Energy Use Emissions in the Industrial Sector", version 4, is applied to the project activity. Furthermore the methodology	

	version(s).	/VCS 1/	applies for the "Tool for determine project emissions from flaring gases containing methane" as per EB 28. The project also considers the provision of AM0013 (version 4) in the context of methane emission factor of 0.241 kgCH ₄ / kg COD for the starch plant wastewater having complex saccharides molecules.	OK
Methodology specific issues				
8.2	<i>In case of approved methodology(ies):</i> (otherwise go ahead with 8.4) Has the approved methodology (ies) been correctly applied?	/PDD/ /AM0022/ /AM0013/	Yes, the approved methodologies have been correctly applied.	OK
8.2.1	<i>Meth selection:</i> Are the rationale for selection and use of the baseline methodologies, as well as the use of such clearly explained?	/PDD/ /AM0022/	The methodology selection has been clearly derived from the type of the project activity. There are no reasonable alternative choices available.	OK
8.2.2	<i>Applicability:</i> Have all applicability criteria been met.	/PDD/ /AM0022/	Yes, all applicability criteria have been met.	OK
8.2.3	<i>Baseline:</i> Has the baseline scenario been determined according to the methodology?	/PDD/ /AM0022/ /VCS 1/	Yes, the baseline scenario is determined according to ACM022 version 04, dated December 22 nd 2006. Several possible baseline scenarios were identified. After a proper assessment the current project lagoon based project situation has been considered as baseline scenario.	OK
8.2.4	<i>Baseline:</i> Has the baseline scenario been determined using conservative assumptions where plausible?	/PDD/ /AM0022/ /VCS 1/ /REF-CDM/	Yes, certain baseline related parameters have been estimated instead of measured (as per decision tree 1 and 2 of AM0022) and referred based on very similar kind of registered CDM project in Thailand. Hence the assumptions and estimations are assessed to be reasonably	OK

			conservative.	
8.2.5	<i>Baseline:</i> Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/PDD/ /AM0022/ /VCS 1/ /SC/	There is no national legislation that requires the implementation of a UASB reactor. Hence, there are no mandatory GHG emission caps imposed by the local jurisdiction.	OK
8.2.6	<i>Baseline:</i> Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/PDD/ /CYB/ /AM0022/ /VCS 1/	Please refer comments under section 8.2.3. Subject to closure of CR 4.	CR 4
8.2.7	<i>Baseline:</i> Have major risks to the baseline been identified?	/PDD/	There are no major risks associated with baseline determination. Nevertheless the closure of CAR 2 is necessary.	CAR 2
8.2.8	<i>Leakage:</i> Is leakage (secondary effects) to be considered and if so are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/PDD/ /AM0022/	Leakage is not applicable as per AM0022 page no. 13.	OK
8.2.9	<i>Emission reduction calculation:</i> Are the calculations for baseline and project emissions documented according to the approved methodology and in a complete and transparent manner?	/PDD/ /AM0022/ /VCS-1/	Yes, the calculation of estimated emission reductions in the PDD and the corresponding spread sheet is found complete and transparent. However the initially submitted monitoring log is not adequate hence CAR 4 has been raised.	CAR 4
8.2.10	<i>Emission reduction calculation:</i> Have conservative assumptions been used when calculating the baseline and project emissions?	/PDD/ /AM0022/ /VCS-1/	No, please refer to section 8.2.9.	CAR 4
8.2.11	<i>Emission reduction calculation:</i> Are uncertainties in the baseline and project emission estimates properly addressed?	/PDD/	Yes, the estimation is OK.	OK
8.2.12	<i>Emission reductions:</i> Are the emission	/PDD/	Yes, the project is credible in terms of real,	OK

	reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/VCS-1/ /AM0022/	measurable and long-term mitigation of climate change.	
Combined Methodologies				
8.3	<i>In case of combined approved methodologies:</i> Have the methodologies been combined in an accurate and transparent manner?	/PDD/ /AM0022/	The only methodology which is applied to the project is AM0022.	OK
Methodologies not approved				
8.4	<i>In case no approved methodology has been applied:</i> Is the methodology applicable and been correctly applied?		Not applicable	-
8.4.1	<i>Applicability:</i> Has a methodology been applied that can be assessed to be equivalent to an approved methodology?		Not Applicable.	-
8.4.2	<i>Baseline:</i> Has the performance standard approach (as defined in the GHG PP) been applied		Not Applicable.	-
8.4.3	<i>Baseline:</i> Have appropriate baseline candidates been identified and have their emission rates been drawn from public references?		Not Applicable.	-
8.4.4	<i>Baseline:</i> Has an appropriate stringency level been selected for the performance standard		Not Applicable.	-
8.4.5	<i>Baseline:</i> Has the baseline scenario been determined using conservative assumptions where plausible?		Not Applicable.	-
8.4.6	<i>Baseline:</i> Does the baseline scenario sufficiently take into account relevant national		Not Applicable.	-

	and/or sectoral policies, macro-economic trends and political aspirations?			
8.4.7	<i>Baseline:</i> Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?		Not Applicable.	-
8.4.8	<i>Baseline:</i> Have major risks to the baseline been identified?		Not Applicable.	-
8.4.9	<i>Leakage:</i> Is leakage (secondary effects) to be considered and if so are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?		Not Applicable.	-
8.4.10	<i>Emission reduction calculation:</i> Are the calculations for baseline and project emissions documented according to the approved methodology and in a complete and transparent manner?		Not Applicable.	-
8.4.11	<i>Emission reduction calculation:</i> Have conservative assumptions been used when calculating the baseline and project emissions?		Not Applicable.	-
8.4.12	<i>Emission reduction calculation:</i> Are uncertainties in the baseline and project emission estimates properly addressed?		Not Applicable.	-
8.4.13	<i>Emission reductions:</i> Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.		Not Applicable.	-
#9: Secondary Effects	Criterion: The VCU Verification Criteria require that secondary effects be incorporated into the calculation methodology in accordance with the WBCSD GHG PP.		Verifier's Action: Verification Entity shall verify and state in the Verification Report that the project's GHG Assessment Boundary is in compliance with the ones indicated in the project documents.	

			Verification Entity shall verify and state in the Verification Report that the GHG Assessment Boundary incorporates all primary effects and significant Secondary Effects.	
9.1	Have secondary effects been identified? In case yes, which?	/PDD/ /AM0022/ /VCS-1/	There are no secondary effects envisaged with this project activity as the project is of captive nature.	OK
9.2	Have the secondary effects been duly accounted for in a conservative and transparent manner?	/PDD/ /AM0022/ /VCS-1/	Please refer comments made under 9.1	OK
9.3	Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining secondary effects?	/PDD/ /GHG/ /AM0022/ /VCS-1/	Please refer comments made under 9.1	OK
9.4	Are the secondary effects covered as defined by the WBCSD GHG Project Protocol (Sec 2.4) as unintended changes caused by the project activity in GHG emissions associated with a GHG Source?	/PDD/ /AM0022/ /VCS-1/ /GHG/	Please refer comments made under 9.1	OK
9.5	Are GHG Assessment Boundary includes all Primary Effects and significant Secondary Effects associated with the GHG project (GHG PP Sec 25).	/PDD/ /AM0022/ /VCS-1/ /GHG/	Yes, all primary effects within the project boundary are included, however there are no secondary effects associated with the project activity.	OK
#10: Project Additiona- lity	Criterion: The VCU Verification Criteria requires that the projects from which emission reductions are created pass an additionality test. Through the Additionality Test the project proponent shall show that mitigation measures result in a real reduction in greenhouse gases against a transparent emissions baseline. Project additionality shall be determined based on one of the four (A-D) additionality tests described herein.		Verifier's Action: A. Verification Entity shall verify and state in the Verification Report that there is clear evidence that each of the following three requirements of the Additionality Test have been met by the project. <u>1. The project is not common practice.</u> • Provision of underlying service or product with the project technology does not exceed 51% in the defined market area. • Business-as-usual technology options are clearly defined and	

		their position on the market proven by official Statistics. <u>2. The project is not required by regulation</u> • Local or National Legislation does not require the production of the underlying service or product with the chosen technology. • Additionally, the Project should not have been undertaken to meet a formal or voluntary target imposed by government regulation or under agreement with a government agency (e.g. the auto manufacturers and the EU, where companies agree to meet reduction targets voluntarily through their industry association). • Carbon credits should not be the byproduct from the creation of an ancillary environmental asset and/or financial instrument (e.g. renewable energy credits). • The emission reductions from the Project must not have been used against any voluntary corporate emission reduction targets. • Project is not a downstream energy efficiency project in a jurisdiction with a mandatory GHG emissions cap on upstream electricity generators. <u>3. The project is not the least cost option for providing the underlying product or service.</u> • Companies shall provide calculations that illustrate that the project is not the Least Cost Option. B. Verification Entity shall verify and state in the Verification Report that there is clear evidence that: • Using the steps in the CDM Additionality tool the project has been undertaken to reduce greenhouse gas emissions beyond normal business practice. C. Verification Entity shall verify and state in the Verification Report that there is clear evidence that: • In addition to a satisfactory project baseline, the project falls within the top quintile (20%) in terms of emissions efficiency for producing the underlying service or product in the region/country. D. Verification Entity shall verify and state in the Verification Report that there is clear evidence that a project is additional because: • the project has selected the appropriate baseline and its project emissions are found to be below the selected baseline. In order to determine the baseline the project will use either of the	
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			following three determination methods: - Determine the baseline based on existing or historical emissions - Determine the baseline based on its industry benchmark under similar social, economic, environmental and technological circumstances - Determine the baseline by identifying the most likely new project activity providing the same level of services as the proposed project.	
10.1	Does the selected baseline represent the most likely scenario among other possible and/or discussed scenarios?	/PDD/ /AM0022/	Yes, five plausible scenarios are discussed under the section B.4 of PDD and the selection of most plausible scenario "Status-quo: sludge is brought to sludge pits (open lagoons)" considered as most credible and plausible scenario amongst the five options.	OK
10.2	Is it demonstrated/justified that the project activity itself is not a likely baseline scenario (examples: through demonstrating investment barriers, technology barriers, barriers to prevailing practices, and/or other barriers or through quantitative evidence that the project would otherwise not be implemented)?	/PDD/ /AM0022/	Yes this is well justified in the PDD using the additionality test stated in VCS-Criteria 10- option A and also in accordance with the barrier test framework of AM0022.	OK
10.3	Have the major risks to the baseline been identified?	/PDD/ /AM0022/	There is no major risk associated with data considered as the source of data is authentic and official.	OK
11: Quality of Reductions	Criterion: <i>The VCU Verification Criteria requires that projects proponents demonstrate that project implementation has no negative impact on sustainable development in the local community.</i>		Verifier's Action: <i>Verification Entity shall verify and state in the Verification Report a project's design and implementation has been carried out in compliance with all relevant local and national environmental and social legislation in the host country.</i>	
11.1	Does the project comply with environmental legislation in the host country?	/PDD/ (Section D) /SC/	Yes.	OK

11.2	Has an analysis of the environmental impacts of the project activity been sufficiently described?	/PDD/ (Section D)	The environmental impacts have been sufficiently described.	OK
11.3	Are all the negative impacts highlighted with reference to intensity or magnitude of the problem sufficiently discussed?	/PDD/ (Section D)	Please refer comments under 11.2.	OK
11.4	Have relevant stakeholders been consulted?		As per VCS it is not required. Hence not performed and not included in PDD.	-
11.5	Has due account been taken of any stakeholder comments received?		As per VCS it is not required. Hence not performed and not included in PDD.	-
#12: Monitoring Process	Criterion: The VCU Verification Criteria requires that for estimating a project's emission reductions the project proponent shall, to the extent possible, use the most recent emission reduction monitoring protocol that has been approved by the CDM Executive Board or the JI Supervisory Committee for that project type.		Verifier's Action: For reductions generated between January 1.2000 and the date of submission, the project proponent shall supply to the Verification Entity a complete Monitoring Report. Verification Entity shall assess the proposed greenhouse gas data management, control and reporting systems, e.g. instructions, procedures, record keeping systems, assumptions, technical equations, models and other means that support complete, accurate, and conservative VCU estimates. Verification Entity shall verify and state in the Verification Report that the project proponent has either (1) used the most recent emission reduction monitoring protocol approved by the CDM Executive Board or JI Supervisory Committee for the project type if available; or if not available has (2) employed monitoring procedures support complete, accurate, and conservative VCU estimates.	
12.1	Monitoring methodology: Is the monitoring methodology applicable for this project and is it previously approved by the CDM/ JI Methodology/ VCS Steering committee Panel?	/PDD/ /AM0022/ /FT/	The approved CDM monitoring methodology AM0022 "Avoided Wastewater and On-site Energy Use Emissions in the Industrial Sector", version 4, is applied to the project activity. Furthermore the methodology applies for the "Tool for determine project emissions from flaring gases containing methane" as per EB 28.	OK
Monitoring Plan				

12.2.1	<i>Monitoring plan:</i> Is the monitoring plan documented in a complete and transparent manner in line with the approved monitoring methodology, if applicable?	/PDD/ (B.7.1.) /FT/	Yes the monitoring plan documented in the PDD is in accordance with AM0022.	OK
12.2.2	<i>Monitoring plan:</i> Is it possible to monitor / measure the specified project GHG indicators? - are measurement methods defined - is the measurement equipment specified - is the measurement accuracy addressed - are measurement intervals defined? - Are procedures defined for maintenance and calibration of monitoring equipment	/PDD/ (B.7.1.) /AM0022/	Yes, see comment above.	OK
12.2.3	<i>Monitoring plan:</i> Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline and project emissions (incl. leakage) within the project boundary during the crediting period?	/PDD/ /AM0022/	Yes, see comment above.	OK
Monitoring Report				
12.3.1	<i>Monitoring report:</i> Has a complete monitoring report (incl. all relevant issues) been submitted to the verifier?	/MR/ /LOG/	The following monitoring parameters (in accordance with AM0022 and Flare Tool) of the reported monitoring period are missing in the draft monitoring log: • ID #2 i. e. wastewater outlet from two UASBs. • ID #8: The calculation (for amount of fossil fuel displaced) based on historic monitoring data of fossil fuel fired for hot oil and steam generations.	GAP 4

		- ID #11 & 19: The concentration of biogas in % (specifying volume or weight basis), corresponding tCH_4/Nm^3 (cp. Equation 7 of AM0022) and corresponding NCV (J/Nm^3). The NCV – methane concentration relation in biogas can be derived based on calorific value of methane as 50.6 GJ/t and mol of methane gas corresponds to 22.71 l. - ID #9, #12 and Flaring Tool: The calculation ($GM01 + GM02 - GM03$) based on monitored data of GM01, GM02 and GM03. The Flaring Tool prescribes to monitor on an hourly basis the "other flare parameters". Accordingly efficiency % factor should be applied for project emissions due to flaring using equation no. 1, no. 15 and provisions of efficiency % selection given in Flaring Tool. Moreover the gas flow rate has to be discounted for dry gas conditions. ID #17: The leakage detection practice and recording of the same is not addressed. The following evidences and the summarized monitored data related to project specific baseline study in acc. with the methodology should be provided to the verification team: - Extract of testing of pre-project specific factors: R_{lagoon} (ref equation 5 of AM 0022) ; $M_{lagoon\ deposition}$ (ref equation 6 and testing methodology under APPENDIX 3 of AM 0022) ;	CAR-2
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			- Specific fuel consumption (HFO in energy unit/ dry starch quantity) from 3 yrs historical data (ref equation 9 of AM 0022) for the burners NCV of the HFO from the fuel supplier (Ref equation 9 of AM 0022). The categorical calculation sheet(s) for the emission reduction covering baseline and project emission in acc. with equation no. (1) – (12) of AM0022 except the provision of on-site electricity generation by biogas should be provided for verification conclusion. In addition to this Calculation spread sheet in accordance with equation no 13 of AM 0022 (covering entire verification period) should be provided. 	~~CR-4~~
12.3.2	<i>Monitoring report:</i> Is the Monitoring report free of material misstatements?	/MR/ /LOG/	The initial monitoring log indicates the gas volume in m³/d whereas all the field gas meters (GM01 – GM03) having provisions to meter and store in Nm³/h. Clarification is necessary. As per the monitoring log, UASB 01 was commissioned on 2004-01-01 and gas-firing for hot oil and steam generation was started on 2004-04-25. The emission reductions during initial non operating time of gas firing for hot utility generation result in negligible amount due to the effect of equation no. (4), (11) and (12) of AM0022. Whether the starting date of emission reductions can be consider as on 2004-01-01 or	CR-1 ~~CR-2~~

			2004-04-25? Clarification is requested.	
12.3.3	<i>Monitoring report:</i> Is the MR in line with the (validated) monitoring plan?	/PDD/ /MR/ /LOG/	Following monitoring/ calibrations to be regularized to facilitate future verification(s): - ID #2: Wastewater flows leaving USAB - ID #15: During regular O&M cycle (minimum annually) Calibration of biogas flow meters and concentration measurement: more frequent to minimize the error in the reading	FAR 1
12.3.4	<i>Monitoring report:</i> Does the MR address any possible changes that might affect the baseline scenario and / or parameters (e.g. changes in legislation, availability of data).	/MR/ /LOG/	There is very less possibility that changes e.g. in legislation might happen. However changes are subject to availability of data (ref. CAR 2).	CAR 2
12.3.5	<i>Monitoring report:</i> Have the volumes of emission reductions been stated for each year separately?	/MR/	Please refer to CAR 4	CAR 4
Monitoring				
12.4.1	<i>Monitoring:</i> Is the monitoring equipment in line with the specifications (as provided in the monitoring plan)?	/PDD/ /LOG/	Please refer to FAR 1.	FAR 1
12.4.2	<i>Monitoring:</i> Have there been any significant incidents, deviant operation modes and / or downtimes of the plant? In case yes, how have they been considered?	/LOG/	No, the plant is in continuous operation since its starting date.	OK
12.4.3	<i>Monitoring:</i> Were there any malfunctions or downtimes of the installed measuring equipment? In case yes, how have they been	/MR/ /LOG/	There is a robust system implemented – state of the art SCADA system.	OK

	considered?			
12.4.4	<i>Monitoring:</i> Have the provisions for maintenance and calibrations of the monitoring equipment been applied according to the monitoring plan? If not how has this been considered?	/MR/ /LOG/ /CAL/	Based on the calibration report of the gas flow meters and the gas concentration the error of the actual meter reading should be adjusted for the net emission reduction calculation. $\pm 3\%$ error is allowed without any adjustment.	CAR 3
12.4.5	<i>Monitoring:</i> Have the data collection, archiving and reporting procedures as defined in the monitoring plan been followed?	/MR/ /LOG/	Please refer to CAR 1. Draft Monitoring log is not very clear (how E_{CH_4-NWTF} has been calculated or estimated).	CAR 1 CR 3
12.4.6	<i>Monitoring:</i> Have the QA/QC procedures been applied in a stringent manner?	/IM03/	Yes, the QA/QC is a part of the certified QMS.	OK
12.4.7	<i>Monitoring:</i> Is it possible to trace the emission reduction calculation parameters to original records (meter readings, log sheets, delivery notes, invoices etc.)	/MR/ /LOG/	Please refer to CAR 2.	CAR 2
12.4.8	<i>Monitoring:</i> Is the emission reduction calculation in line with the applied methodology and correct?	/AM0022/ /XCS/	Yes, no deviations from the stipulations of AM0022 have been identified. However CAR 4 has been raised. Furthermore according to AM0022 the value applied for the methane emission factor indicated as $0.21 \text{ kgCH}_4/\text{kgCOD}$ in the draft monitoring log is not convincing as starch process wastewater contains complex saccharides. (cp. Eq.2 EF_{CH_4})	CAR 4 CR 4
12.4.9	<i>Monitoring:</i> Is the accuracy of the involved metering device lower than the Minimum of (a) $\pm 3\%$ or (b) the specific range given in the MRG table 2?	/PDD/ /MR/ /IM03/	Please refer to CAR 3 and FAR 1	CAR 3 FAR 1
12.4.10	<i>Monitoring:</i> Is a material error (determined as a misstatement where aggregate omissions, misrepresentations, or errors in the total emissions figure) smaller than 5 %.	/MR/	Please refer to CR 1, CAR 3 and FAR 1.	CR 1 CAR 3 FAR 1

#13: General topics	Criterion: <i>The project description should be in line with all applicable standards for project documentation though a specific issue may be not explicitly addressed in the VCS::</i>		Verifier's Action: <i>The Verification Entity shall verify that the Project documentation is complete, free of (major) misstatements and unambiguous.</i>	
13.1	Is the project activity clearly described?	/PDD/	Yes, it is clearly described in A.2 and A.4.3. in the PDD.	OK
13.2	Has the PDD form been duly filled?	/PDD/ section A.4.3	Yes, all sections in the PDD have been duly filled except section E. Please refer to 11.4. and 11.5.	OK
13.3	Are all assumptions clearly explained and documented?	/PDD/ /MR/	Yes, all assumptions are explained and documented to the necessary extent unless stated differently in above mentioned CARs or CRs.	Not yet OK
13.4	Has all background data been clearly identified and referenced?	/PDD/ /MR/	Refer to CAR 2.	CAR 2
13.5	Are all formulas used for calculation are clearly stated?	/PDD/ /MR/	All applied formulae including the calculation of baseline and project emission are clearly stated in the PDD. However the monitoring report is not complete. Hence CAR 4 has been raised.	CAR 4
13.6	Are all calculations incorporated or referenced?	/PDD/ /MR/	All used calculations are incorporated in the PDD.	OK
13.7	Is confidential information clearly identified?		Not applicable.	-
13.8	Has all necessary information been made available to the verifier?	/IM01/	Depends on the closure of CAR 2.	Not yet OK

Draft report clarification requests and corrective action requests by validation team	Reference (PDD, MR, Checklist)	Summary of project owner response	Revised sections (as applicable)	Validation team conclusion
based on monitored data of GM01, GM02 and GM03. The Flaring Tool prescribes to monitor on an hourly basis the "other flare parameters". Accordingly efficiency % factor should be applied for project emissions due to flaring using equation no. 1, no. 15 and provisions of efficiency % selection given in Flaring Tool. Moreover the gas flow rate has to be discounted for dry gas conditions. ID #17: The leakage detection practice and recording of the same is not addressed.		1040. Gas flow rate has been adjusted to dry conditions. ID #17: revision of PDD to address detection practice	B.7.1 and calculation sheets B.7.1	Necessary changes were applied in the revised PDD. OK.
CAR 2 The following evidences and the summarized monitored data related to project specific baseline study in acc. with the methodology should be provided to the verification team: Extract of testing of pre-project specific factors: R_{lagoon} (ref equation 5 of AM 0022) ; $M_{\text{lagoon deposition}}$ (ref equation 6 and testing methodology under APPENDIX 3 of AM 0022) ;	/MR/ /LOG/ 12.3.1 12.3.4 12.4.7 13.4	Rlagoon value from registered project no 1040 analysis as own pre-project analysis is not available.	B.6.2	The value 87.88 % as provided in the registered CDM project activity no. 1040 was applied and assessed as appropriate.

Draft report clarification requests and corrective action requests by validation team	Reference (PDD, MR, Checklist)	Summary of project owner response	Revised sections (as applicable)	Validation team conclusion
- Specific fuel consumption (HFO in energy unit/ dry starch quantity) from 3 yrs historical data (ref equation 9 of AM 0022) for the burners - NCV of the HFO from the fuel supplier (Ref equation 9 of AM 0022). Also log of density of HFO is required for physical quantity conversion.		A separate monitoring sheet has been added to the documentation. NCV and density of HFO from registered project 1040 Korat Waste to Energy.	Reference in B.6.3 is added	M_{lagoon deposition} was applied at zero which is sufficient. The monitoring sheet demonstrates all necessary data. The applied data from the registered CDM project activity are adequate. In conclusion CAR 2 is solved.
CAR 3 Based on the calibration report of the gas flow meters and the gas concentration the error of the actual meter reading should be adjusted for the net emission reduction calculation. $\pm 3\%$ error is allowed without any adjustment.	/MR/ /LOG/ /CAL/ 12.4.4 12.4.9 12.4.10	Calibration reports report error of below 3%.	Calibration report added to documentation	Yes, the provided calculation sheets demonstrate that the measurement errors are within a range of $\pm 3\%$. CAR is closed.
CAR 4 The categorical calculation sheet(s) for the emission reduction covering baseline and project emission in acc. with equation no. (1) – (12) of AM0022 except the provision of on-site electricity generation by biogas should be provided for verification conclusion.	/MR/ /LOG/ 12.3.1 12.3.5 12.4.8 13.5	Calculation sheets have been revised. Equation 13 has been added to	Calculation sheet has been added to documentation	The calculation spreadsheets were provided to the verifier including all necessary calculations, also referenced equation 13. Thus the CAR is closed.

Draft report clarification requests and corrective action requests by validation team	Reference (PDD, MR, Checklist)	Summary of project owner response	Revised sections (as applicable)	Validation team conclusion
In addition to this, calculation spread sheet in accordance with equation no 13 of AM0022 (covering entire verification period) should be provided.		calculation sheets		
Clarification Requests				
CR 1 The initial monitoring log indicates the gas volume in m ³ /d whereas all the field gas meters (GM01 – GM03) having provisions to meter and store in Nm ³ /h. Clarification is necessary.	/MR/ /LOG/ 12.3.2 12.4.10	All measurements are in Nm ³ . Revisions in the monitoring log have been made accordingly.		OK.
CR 2 As per the monitoring log, UASB 01 was commissioned on 2004-01-01, which is stated as crediting period start date in section C of the PDD, and gas-firing for hot oil and steam generation was started on 2004-04-25. The emission reductions during initial non operating time of gas firing for hot utility generation result in negligible amount due to the effect of equation no. (4), (11) and (12) of AM0022. Whether the starting date of emission reductions can be consider as on 2004-01-01 or 2004-04-25? Clarification is requested.	/MR/ /LOG/ 12.3.2 12.4.10	The crediting period is to begin January 1 st 2004 (as before, no change).		OK, the PDD demonstrates the same. CR is closed.
CR 3	12.4.5	Estimate from registered project		This approach was

Draft report clarification requests and corrective action requests by validation team	Reference (PDD, MR, Checklist)	Summary of project owner response	Revised sections (as applicable)	Validation team conclusion
Draft Monitoring log is not very clear (how E_{CH_4-NWTF} has been calculated or estimated).		1040 "Korat Waste to Energy" has been used.		assessed as appropriate. Hence CR is closed.
CR 4 According to AM0022 the value applied for the methane emission factor indicated as 0.21 kgCH ₄ /kgCOD in the draft monitoring log is not convincing as starch process wastewater contains complex saccharides. (cp. Eq.2 EF_{CH_4})	/AM0022/ 12.4.8	The methane emission factor has been revised using actual, measured information re: COD removal and biogas production. The new value of 0.245 has been applied.	B.6.3 B.7.1	The revised value is appropriate. The CR is closed.
Forward Action Requests				
FAR 1 Following monitoring/ calibrations to be regularized to facilitate future verification(s): - ID #2: Wastewater flows leaving USAB - ID #15: During regular O&M cycle (minimum annually) - Calibration of biogas flow meters and concentration measurement: more frequent to minimize the error in the reading	/PDD/ /MR/ /LOG/ 12.3.3 12.4.1 12.4.10	ID #2: the assumption that the UASB reactor operates in hydrological balance appears robust and is likely to remain standard practice unless otherwise instructed by DOE. ID #15: the project developer will implement this FAR. Calibration will be conducted on annual basis in the future.		The same will be verified during future verification.