
VERIFICATION AND CERTIFICATION REPORT

Reliance Industries Ltd

*Reduction in Steam Consumption
in Stripper Reboilers Through
Process Modifications*

SGS Climate Change Programme

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Project Title:			
Reduction in Steam Consumption in Stripper Reboilers Through Process Modifications			
Organisation:		Client:	
SGS United Kingdom Limited		Reliance Industries Ltd.	
Publication of Monitoring Report:			
Monitoring Period:		15/05/2006 to 03/02/2008	
First Monitoring report Version and Date:		version 1 dated 15/02/2008	
Final Monitoring report Version and Date:		version 4 dated 17/01/2009	
Summary:			
<p>SGS United Kingdom Ltd has performed the Second periodic verification of the CDM project "Reduction in Steam Consumption in Stripper Reboilers Through Process Modifications" UNFCCC No. 0340. The verification includes confirming the implementation of the monitoring plan of the registered PDD UN 0340 and the application of the monitoring methodology as per AM0018 version 01. A site visit was conducted to verify the data submitted in the monitoring report.</p> <p>The project activity is basically an energy efficiency project which leads to reduction of 15.8 TPH of HHP steam generated in the Auxiliary Boiler. As a result, fuel combusted to generate this quantity of steam is reduced leading to reduction in GHGs that are products of the fuel combustion process.</p> <p>SGS confirms that the project is implemented in accordance with the validated and registered Project Design Document. The monitoring system is in place and the emission reductions are calculated without material misstatements. Our opinion relates to the projects GHG emissions and the resulting GHG emission reductions reported and related to the valid and registered project baseline and monitoring and its associated documents. Based on the information seen and evaluated we confirm that the implementation of the project has resulted in 63,961 tCO₂e during period 15/05/2006 to 03/02/2008.</p>			
Subject:			
CDM Verification			
Verification Team:			
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Abbreviations

ACM	Approved Consolidated Methodology
BFW	Boiler Feed Water
BEF	Baseline Emission Factor
BFW	Boiler Feed Water
BTU	British Thermal Unit
CAR	Corrective Action Request
CO2	Carbon Dioxide
CEA	Central Electricity Authority
CER	Carbon emission Reductions
CDM	Clean Development Mechanism
CDU	Crude Distillation Unit
CPP	Captive Power Plant
DCS	Distributed Control System
DOE	Designated Operational Entity
FCO	Field Change Order
HHP	High High Pressure (equivalent to superheated)
HP	High Pressure
kJ	Kilo joules
MW	Mega Watt
MWh	Mega Watt Hour
MT	Metric Tonnes
PDD	Project Design Document
R&D	Research and Development
RFG	Refinery Fuel Gas
RFO	Residual Fuel Oil
RIL	Reliance Industries Limited
SCM	Standard Cubic Meter
tCO2e	Tonnes of carbon dioxide equivalent
TPD	Tonnes per Day
TPH	Tonnes per Hour

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1. Introduction

1.1 Objective

SGS United Kingdom Ltd has been contracted by Reliance Industries Ltd. to perform an independent verification of its CDM project “Reduction in Steam Consumption in Stripper Reboilers Through Process Modifications”. CDM projects must undergo periodic audits and verification of emission reductions as the basis for issuance of Certified Emission Reductions (CERs).

The objectives of this verification exercise are, by review of objective evidence, to establish that:

- The emissions report conforms with the requirements of the monitoring plan in the registered PDD and the approved methodology; and
- The data reported are complete and transparent.

1.2 Scope

The scope of the verification is the independent and objective review and ex post determination of the monitored reductions in GHG emission by the project activity. The verification is based on the validated and registered project design document and the monitoring report. The project is assessed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures and related rules and guidance.

SGS has, based on the recommendations in the Validation and Verification Manual, employed a risk-based approach in the verification, focusing on the identification of significant reporting risks and the reliability of project monitoring.

The verification is not meant to provide any consulting towards the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 Project Activity and Period Covered

This engagement covers emissions and emission reductions from anthropogenic sources of greenhouse gases included within the project boundary of the following project and period.

Title of Project Activity:	“Reduction in Steam Consumption in Stripper Reboilers Through Process Modifications”
UNFCCC Registration Number:	UN No. 340
Monitoring Period Covered in this Report	15/05/2006 to 03/02/2008
Project Participants	Reliance Industries Ltd.
Location of the Project Activity:	The site is located at latitude 22° 22' N, longitude 69° 51' E adjacent to the town of Jamnagar in Gujarat State, India

The project activity is basically an energy efficiency project which leads to reduction of 15.8 TPH of HHP steam generated in the Auxiliary Boiler. As a result, fuel combusted to generate this quantity of steam is reduced leading to reduction in GHGs that are products of the fuel combustion process.

2. Methodology

2.1 General Approach

SGS's approach to the verification is a two-stage process.

In the first stage, SGS completed a strategic review and risk assessment of the projects activities and processes in order to gain a full understanding of:

- Activities associated with all the sources contributing to the project emissions and emission reductions, including leakage if relevant;
- Protocols used to estimate or measure GHG emissions from these sources;
- Collection and handling of data;
- Controls on the collection and handling of data;
- Means of verifying reported data; and
- Compilation of the monitoring report.

At the end of this stage, SGS produced a Periodic Verification Checklist which, based on the risk assessment of the parameters and data collection and handling processes for each of those parameters, describes the verification approach and the sampling plan.

Using the Periodic Verification checklist, SGS verified the implementation of the monitoring plan and the data presented in the Monitoring Report for the period in question. This involved a site visit and a desk review of the monitoring report. This verification report describes the findings of this assessment.

2.2 Verification Team for this Assessment

Name	Role	SGS Office
Mr. Nikunj Agarwal	Lead Assessor	SGS India
Mr. Jimmy Sah	Local Assessor	SGS India

2.3 Means of Verification

2.3.1 Review of Documentation

The validated PDD, the monitoring report submitted by the client and additional background documents related to the project performance were reviewed. A complete list of all documents reviewed is attached in section 8 of this report.

2.3.2 Site Visits

As part of the verification, the following on-site inspections have been performed

Location: Jamnagar, Gujarat	
Date: 28 th -29 th February 2008	
Coverage:	Source of Information / Persons Interviewed
Plant details and Monitoring Plan Implementation & Management Review	Mr. Hasmukh V. Lodhia(Vice President), Mr. P. Kandasamy (Sr. Manager - Instrument)
Assessment of QA/QC procedures and the strategic monitoring procedures, MIS Data	Mr. Sanjay Seal (Project Department – CDM Cell) Ms. Gauri Bholay (Project Department – CDM Cell) Mr. N.M. Zode (Manager – CTS)
Data Collection and archiving procedures	Mr. Sanjay Seal (Project Department – CDM Cell) Ms. Gauri Bholay (Project Department – CDM Cell)
Plant, Lab & Store records	Mr. Sanjay Seal (Project Department – CDM Cell) Mr. Sanjay V. Patel (Sr. Manager – CPP Operation) Ms. Gauri Bholay (Project Department – CDM Cell)

2.4 Reporting of Findings

As an outcome of the verification process, the team can raise different types of findings

In general, where insufficient or inaccurate information is available and clarification or new information is required the team shall raise a New Information Request (NIR) specifying what additional information is required.

Where a non-conformance arises the team shall raise a Corrective Action Request (CAR). A CAR is issued, where:

- I. the verification is not able to obtain sufficient evidence for the reported emission reductions or part of the reported emission reductions. In this case these emission reductions shall not be verified and certified;
- II. the verification has identified misstatements in the reported emission reductions. Emission reductions with misstatements shall be discounted based on the verifiers ex-post determination of the achieved emission reductions

The verification process may be halted until this information has been made available to the assessors' satisfaction. Failure to address a NIR may result in a CAR. Information or clarifications provided as a result of an NIR may also lead to a CAR.

Observations may be raised which are for the benefit of future projects and future verification actors. These have no impact upon the completion of the verification activity.

Corrective Action Requests and New Information Requests are detailed in Periodic Verification Checklist. The Project Developer is given the opportunity to "close" outstanding CARs and respond to NIRs and Observations.



2.5 Internal Quality Control

Following the completion of the assessment process and a recommendation by the Assessment Team, all documentation will be forwarded to a Technical Reviewer. The task of the Technical Reviewer is to check that all procedures have been followed and all conclusions are justified. The Technical Reviewer will either accept or reject the recommendation made by the assessment team.

3. Verification Findings

3.1 Project Documentation and Compliance with the Registered PDD

The PDD for the project activity mentions the plant capacity as 6960 Tons per day but the monitoring report and emission reduction sheet provided mentioned the plant capacity as 7680 tons per day, thus justification for the same was raised as CAR 1. The project proponent clarified that as per the methodology AM0018 it requires quantifying the effect of any changes within project boundary on emission reduction, thus a trial was conducted in the month of February 2007 to assess the impact of increased production on specific steam consumption ratio (SSCR). It was found that the baseline SSCR remains the same for this increased nominal production. The same was described in the trial report which was discussed during the site visit, however DOE ask for the clarification from the UNFCCC

<http://cdm.unfccc.int/UserManagement/FileStorage/RZNBDD9FBFI87KGQ03TGI4MZ5D69J4>, In response of the clarification meth panel suggest for the deviation

http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_A89EM0NTC460KBR64T13E0P3PKFO9S. Hence the deviation was sought

<http://cdm.unfccc.int/UserManagement/FileStorage/T7YCZ26OB03FOH26G6UPFCAMYALQ41> which was approved by the EB

http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_OPUK4E1S04A1DTI2VP44A3D19KBD1 thus CAR 1 was closed out.

During the review of the monitoring report version 1 it was observed that the tag numbers mentioned for equipments do not match with the same as described in the PDD, thus CAR 2 was raised and the project proponent was asked to clarify the same, also the CDM manual was asked to be submitted for the project activity to check the QA/QC procedures for the project activity, also the date in the footer of monitoring report version 1 was not clear thus clarification for the same was sought. In response the project proponent clarified that the tag numbers are mentioned twice in the PDD, one under the section D.2.1.1 and the other under the section D.2.1.3. The mismatch was observed as there was a typo-graphical error in the tag numbers mentioned under the section D.2.1.1, the tag numbers mentioned in the monitoring report and section D.2.1.3 was checked and found to be matching, thus was acceptable. The project proponent provided the CDM manual and the calibration certificates for the project activity, the same were checked and is acceptable, also under the revised monitoring report submitted the date in the footer was revised to correct the same. Thus CAR 2 was closed out.

The monitoring report version 1 was reviewed and it was observed that the reference to the methodology used was not described in the report, thus CAR 3 was raised and the project proponent was asked to describe the methodology used for the project activity. In response the project describe the methodology used AM0018 under the section 1 of the revised monitoring report. The same was checked and found acceptable, thus CAR 3 was closed out.

The monitoring report version 1 was checked and it was observed that external data is being used in the project activity but the same has not been described, thus NIR 4 was raised and the project proponent was asked to clarify the same. In response the project proponent provided the revised monitoring report incorporating the details of the external data used under the section 6, the same was checked and found acceptable, thus NIR 4 was closed.

3.2 Monitoring Results

The parameter **LPG from Stabilizer m³/hr**, [CDU-I] is measured online and is being displayed in DCS system and is being recorded in MIS System daily. The daily data has been considered for the emission reduction calculation. The daily samples were verified from the plant Record. The values were found to be matching. The calibration of the flow meter was done annually and the calibration certificate (ref. 100000335673) for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent. PP has reported the daily values in the excel sheet but it is requested to please put the average values for the LPG in the next verification as the DOE has to calculate the average values themselves to cross verify the figures mentioned in the monitoring report. FAR 1 was raised.

The parameter **Naphtha from Stabilizer m³/hr**, [CDU-I] is measured online and is being displayed in DCS system and is being recorded in MIS System daily. The daily data has been considered for the emission reduction calculation. The daily samples were verified from the plant Record. The values were found to be matching. The calibration of the flow meter was done annually and the calibration certificate (ref. 100000335674) for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent. PP has reported the daily values in the excel sheet but it is requested to please put the average values for the LPG in the next verification as the DOE has to calculate the average values themselves to cross verify the figures mentioned in the monitoring report. FAR 1 remained open.

The parameter **Output from stripper MT/hr**, [CDU-I] is calculated by the addition of LPG from Stabilizer and Naphtha from Stabilizer. The daily values are used for calculation of emission reductions the same was verified with the plant Records. The values were found to be matching.

The parameter **MP steam to stripper Ton/hr**, [CDU-I] is measured online and is being displayed in DCS system and is being recorded in MIS System daily. The daily data has been considered for the emission reduction calculation. The daily samples were verified from the plant Record. The values were found to be matching. The calibration of the flow meter was done annually and the calibration certificate (ref. 100000335675) for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent

The parameter **LPG from Stabilizer m³/hr**, [CDU-II] is measured online and is being displayed in DCS system and is being recorded in MIS System daily. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant Record. The values were found to be matching. The calibration of the flow meter was done annually and the calibration certificate (ref. 100000334307) for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent. PP has reported the daily values in the excel sheet but it is requested to please put the average values for the LPG in the next verification as the DOE has to calculate the average values themselves to cross verify the figures mentioned in the monitoring report. FAR01 was raised.

The parameter **Naphtha from Stabilizer m³/hr**, [CDU-II] is measured online and is being displayed in DCS system and is being recorded in MIS System daily. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant Record. The values were found to be matching. The calibration of the flow meter was done annually and the calibration certificate (ref. 100000334308) for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent PP has reported the daily values in the excel sheet but it is requested to please put the average values for the LPG in the next verification as the DOE has to calculate the average values themselves to cross verify the figures mentioned in the monitoring report. FAR01 was raised.

The parameter **Output from stripper MT/hr**, [CDU-II] is calculated by the addition of LPG from Stabilizer and Naphtha from Stabilizer. The daily values are used for calculation of emission reductions the same was verified with the plant Records. The values were found to be matching.

The parameter **MP steam to stripper Ton/hr**, [CDU-II] is measured online and is being displayed in DCS system and is being recorded in MIS System daily. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant Record. The values were found to be matching. The calibration of the flow meter was done annually and the calibration certificate (ref. 100000374434) for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent

The parameter **Boiler steam (HP) required for MP steam (Ton/hr)** was calculated as Boiler steam (HP) required for MP steam = MP steam quantity * ratio of HP steam enthalpy to MP steam enthalpy. Thus the Temperature, pressure and Enthalpy for HP steam and MP steam was being monitored. The same is recorded daily and was checked with the MIS data and the plant data logger system (IP21) and found to be matching. The calibration of the temperature indicator and the pressure gauges was done annually and the calibration certificate for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent.

The parameter **HP Steam generated (Ton/hr)** is measured online and is being displayed in DCS system and is being recorded in MIS System daily, the same monitoring and recording procedure is being followed for all the four boilers. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant the plant data logger system (IP21). The values were found to be matching. The calibration of the flow meters was done annually and the calibration certificate for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent

The parameter **RFO to Boilers (Ton/hr)** is measured online and is being displayed in DCS system and is being recorded in MIS System daily, the same monitoring and recording procedure is being followed for all the four boilers. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant the plant data logger system (IP21). The values were found to be matching. The calibration of the flow meters was done annually and the calibration certificate for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent

The parameter **RFG to Boilers (Ton/hr)** is measured online and is being displayed in DCS system and is being recorded in MIS System daily, the same monitoring and recording procedure is being followed for all the four boilers. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant the plant data logger system (IP21). The values were found to be matching. The calibration of the flow meters was done annually and the calibration certificate for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent.

The parameter **HP Steam Temperature (°C)** is measured online and is being displayed in DCS system and is being recorded in MIS System daily, the same monitoring and recording procedure is being followed for all the four boilers. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant the plant data logger system (IP21). The values were found to be matching. The calibration of the temperature indicator and thermocouple was done annually and the calibration certificate for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent

The parameter **HP Steam Pressure (Bar)** is measured online and is being displayed in DCS system and is being recorded in MIS System daily, the same monitoring and recording procedure is being followed for all the four boilers. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant the plant data logger system (IP21). The values were found to be matching. The calibration of the pressure gauge was done annually and the calibration certificate for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent

The parameter **BFW Temperature (°C)** is measured online and is being displayed in DCS system and is being recorded in MIS System daily, the same monitoring and recording procedure is being followed for all the four boilers. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant the plant data logger system (IP21). The values were found to be matching. The calibration of the temperature indicator and the thermocouple was done annually and the calibration certificate for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent

The parameter **MP Steam Pressure (Bar)** is measured online and is being displayed in DCS system and is being recorded in MIS System daily, the same monitoring and recording procedure is being followed for all the four boilers. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant the plant data logger system (IP21). The values were found to be matching. The calibration of the pressure gauge was done annually and the calibration certificate for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent

The parameter **MP Steam Temperature (°C)** is measured online and is being displayed in DCS system and is being recorded in MIS System daily, the same monitoring and recording procedure is being followed for all the four boilers. The daily data has been considered for the emission reduction calculation. The samples were verified for each month to verify the same in the plant the plant data logger system (IP21). The values were found to be matching. The calibration of the temperature indicator and thermocouple was done annually and the calibration certificate for the monitoring period 15/05/2006 – 03/02/2008 was checked and found consistent

Boiler Efficiency, (%) has been Calculated monthly by direct method with the help of following parameters:

1. The generated steam enthalpy parameters (steam temperature, pressure and quantity) is continually monitored and entered in log-book at periodic intervals every day.
2. The fuel meters are available, which record the fuel flow on continual basis.

The parameter **Retrofit in Boilers**, there was no retrofit observed in the project boundary during the monitoring period.

Specific Steam Consumption, Ton/Ton, [CDU-I & II] is calculated as MP steam consumed per day / Total production per day. The same is monitored daily for the both the units and was checked with the MIS data and found to be matching.

3.3 Remaining Issues, CAR's, FAR's from Previous Validation or Verification

No Issues

3.4 Project Implementation

Project was implemented and equipment installed as described in the registered PDD;

The project is already implemented and working in satisfactory condition.

3.5 Completeness of Monitoring

The reporting procedures reflect the content of the monitoring plan. The monitoring mechanism is effective and reliable

3.6 Accuracy of Emission Reduction Calculations

The calculation of emission reductions is found to be correct. CARs were raised and the same were discussed and were closed based on discussion and revision of the monitoring report and excel sheet for calculation of emission reduction, the response to NIRs was satisfactory and these were closed. The details of the reported and the verified values for all parameters are listed in section 4.

3.7 Quality of Evidence to Determine Emission Reductions

Critical parameters used for the determination of the Emission Reductions are discussed above in section 3.2 above. All the data recorded is in compliance with the monitoring report.

3.8 Management System and Quality Assurance

The companies involved in the project have ISO14001:2004 quality assurance system implemented, therefore we can affirm that the management system the CDM project is in place; with the responsibilities properly identified and in place.

In order to verify data quality, the Companies involves in the project works in accordance with a quality assurance procedure (*Procedure for Monitoring Plan Implementation*), which establishes the operational and management structure implemented.

3.9 Data from External Sources

The external data used in the project used are as follows,

Fuel oil emission factor, Refinery fuel gas emission factor, Fuel oil net calorific value and Refinery fuel gas net calorific value the same was cross-checked as mentioned in D 2.1 of registered PDD, values are sourced from Table 1 (Net calorific values and emission factors for oils as found in the 1996 IPCC guidelines) of Chapter 2 (CO₂ emissions from stationary combustion of fossil fuels) of "Good Practice Guidance and Uncertainty Management in National Green House Gas Inventories".

4. Calculation of Emission Reductions

Parameter	Reported Value	Verified Value
LPG from stripper (day avg)	64.22	64.22
Naphtha from stripper (day avg)	432.29	432.29
Stripper output for the day	7369	7369
Steam consumption for the day	516	516
Sp. MP steam consumption in project activity case	0.07	0.07
Sp. MP steam consumption in baseline case	0.103	0.103
Reduction in Sp.MP steam consumption	0.0331	0.0331
Reduction in daily MP steam consumption	243.07	243.07
HP steam temperature	514.02	514.02
HP steam pressure	110.02	110.02
Enthalpy of HP at boiler outlet	3398.18	3398.18
BFW temperature	146.69	146.69
Heat content of feed water	646.02	646.02
Net enthalpy of HHP steam supplied by boiler	2752.16	2752.16
MP steam temperature	295.52	295.52
MP steam pressure	17.22	17.22
Enthalpy of MP Steam used in reboiler	3055.9	3055.9
Reduction in HP steam consumption due to project activity	219.13	219.13
Energy equivalent to HP steam reduction	0.6031	0.6031
FO fired	7791	7791
RFG fired	7346	7346
Calorific value of FO	40	40
Calorific value of RFG	48	48
Fuel energy input to boiler	667	667
HP steam generated in boiler	231531	231531
Steam energy output from boiler	637	637
Efficiency of Boiler	0.9549	0.9549
Fuel energy saved in the boiler equivalent to HP steam reduction	0.6016	0.6016
Emission factor for FO	76.6	76.6
Emission reduction	48.22	48.22

As per methodology, Emission reductions are determined ex-post by multiplying the improvement of the baseline benchmark SSCR with the actual, monitored output of the project after implementation. This is done in the following steps:

Estimate the difference in SSCR of baseline and project scenarios.

$$SSCR_{diff} = SSCR - SSCR_1$$

Where,

$SSCR_{diff}$ = difference in SSCR of baseline and project scenarios (T/T)

SSCR = Specific Steam Consumption Ratio in the baseline (T/T)

$SSCR_1$ = Specific Steam Consumption Ratio for the project activity (T/T)

Estimate net daily reduction in steam consumption

$$S = SSCR_{diff} \times P_{act}$$

where

S = Net reduction in MP steam consumption (TPD)

$SSCR_{diff}$ = difference in SSCR of baseline and project scenarios (T/T)

P_{act} = Actual value of output (TPD)

Estimate the net daily reduction in energy due to reduction in steam consumption

a) To convert MP steam to HP steam :

The steam is consumed in the project activity at Medium Pressure (MP). The boiler generated steam at higher pressure (HP). To convert MP to HP steam:

$$S_{net} = S \times \frac{H_{MP}}{H_{HP}}$$

Where

S_{net} = Reduction in HP steam generation in boiler (TPD)

S = Net reduction in MP steam consumption (TPD)

H_{MP} = Enthalpy of MP steam (to be calculated from temperature and pressure) (kJ/T)

H_{HP} = Enthalpy of HP steam (to be calculated from temperature and pressure) (kJ/T)

b) Energy equivalent of steam reduction in boiler

$$E_{net} = S_{net} \times E_s$$

Where

E_{net} = Net reduction in steam energy consumption (kJ/day)

S_{net} = Net reduction in steam consumption (TPD)

E_s = Net enthalpy of steam being supplied from boiler (kJ/day)

And

$$E_s = E_{tot} - E_{fw}$$

where

E_s = Net enthalpy of steam being supplied in boiler (kJ/T). (To be monitored)

E_{tot} = Total enthalpy of steam at the boiler outlet (kJ/T)

E_{fw} = Heat content of feed water (kJ/T)

Estimate daily reduction in input energy to the boiler

$$E_{in} = E_{net} / \eta_b$$

where

E_{in} = Energy input in boiler (kJ/day)

E_{net} = Net reduction in steam energy consumption per day (kJ/day)

η_b = Efficiency of boiler, to be monitored periodically by direct method. There are four boilers and average efficiency is calculated based on average temperatures, pressures (steam, BFW) and sum of flows (Steam, fuel). (Fraction)

Estimate CO₂ emission reductions (C_{er}) in the boiler per day

Boilers consume fuel oil and Refinery Fuel Gas as fuel mix. However, the reduction in energy consumption in boiler results into reduction in fuel oil consumption only because all the RFG generated in refinery is required to be consumed. Hence carbon emission factor for only FO is considered for calculation of C_{er}

$$C_{er} = E_{in} \times F_{FO}$$

Where,

C_{er} = CO₂ emission reductions in the boiler (t CO₂/day)

E_{in} = Reduction in Energy input in boiler (TJ/day)

F_{FO} = Carbon emission factor for fuel oil (IPCC default factor) (t CO₂/TJ)

Estimate additional CO₂ emissions due to additional electrical load in project scenario

There is no additional electrical load due to project activity.

Estimate the net CO₂ emission reductions due to project

$$C_{emet} = C_{er}$$

where

C_{emet} = net CO₂ emission reductions due to the project (t CO₂/day)

C_{er} = CO₂ emission reductions in the boiler per day (t CO₂/day)

Net Emission Reduction = 63961 tCO₂

5. Recommendations for Changes in the Monitoring Plan

The monitoring plan is to be revised before the next verification such as to be in compliance with the monitoring methodology AM0018 version 01 (as per EB 33 para 75) as the parameter “Boiler Feed water is missing” in the monitoring plan of the registered PDD.

The method applied for determination of BFW Enthalpy is accepted due to consistency with previous verifications for this monitoring period. A FAR has been raised to ensure that a project internal review process takes place. Outcome of the review should be a change in the monitoring practice to come into compliance with AM0018. This review should be closed before next periodic verification.

PP does have direct online monitoring for this parameter at the site and DOE have checked that the data is also available for the same. There are three parameters which add up to give total BFW flow, hence incorporating the same in monitoring will increase (3 x 6 boilers) 18 parameters. In the calculations, PP has used BFW flow equal to steam flow for calculation of BFW enthalpy. Net steam enthalpy = Steam enthalpy - BFW enthalpy. Actual BFW flow is more than steam flow, thus BFW enthalpy will increase than what is presently considered for Emission Reduction calculations. Hence Net steam enthalpy will reduce. Boiler efficiency = Net steam enthalpy x steam flow / fuel energy. (Lesser the net steam enthalpy, lesser is boiler efficiency.) Emission reduction = Reduction in steam consumption x EF of fuel / efficiency of boiler. (Lesser the boiler efficiency, more will be emission reduction.)

Hence Lower the BFW flow, lower will be emission reduction. Hence the present emission reduction calculation is conservative and hence accepted by the DOE for this monitoring period.

6. Overview of Results

Assessment Against the Provisions of Decision 17/CP.7:

Is the project documentation in accordance with the requirements of the registered PDD and relevant provision of decision 17/CP.7, EB decisions and guidance and the COP/MOP?

Yes. The results of the compliance assessment are recorded in the verification checklist which is used as an internal report only.

Have on-site inspections been performed that may comprise, inter alia, a review of performance records, interviews with project participants and local stakeholders, collection of measurements, observations of established practices and testing of the accuracy of monitoring equipment?

Yes. Lead Assessor, Mr. Nikunj Agarwal and Local Assessor, Mr. Jimmy Sah visited the sites and undertook interviews, collected data, audited the implementation of procedures, checked calibration certificates and checked data, inter alia.

The results of the site visits are recorded in the verification checklist which is used as an internal report only.

The evidences have been checked and collected. The revised monitoring report is attached with this verification report.

Has data from additional sources been used? If yes, please detail the source and significance.

Data from external sources such as IPCC has been used in the project activity for calculation of emission reductions and the same have been described under the section 3.9 of this document.

Please review the monitoring results and verify that the monitoring methodologies for the estimation of reductions in anthropogenic emissions by sources have been applied correctly and their documentation is complete and transparent.

Yes. The monitoring methodology has been correctly applied and the monitoring report and supporting references are complete and transparent.

Have any recommendations for changes to the monitoring methodology for any future crediting period been issued to the project participant?

No recommendations have been issued.

Determine the reductions in anthropogenic emissions by sources of greenhouse gases that would not have occurred in the absence of the CDM project activity, based on the data and information using calculation procedures consistent with those contained in the registered project design document and the monitoring plan.

The data used in anthropogenic emission reduction calculation is consistent with those contained in the registered PDD and monitoring plan. The emission reduction was 54,958 tCO₂ for the period 15/05/2006 to 03/02/2008 as per the estimation made in the registered PDD. The actual emission reduction has been verified as 63,961 tCO₂ for the same period.

Identify and inform the project participants of any concerns related to the conformity of the actual project activity and its operation with the registered project design document. Project participants shall address the concerns and supply relevant additional information.

"No such non conformity of the actual project activity and its operation with the registered project design document has been observed."

Post monitoring report on UNFCCC website

Yes, the monitoring report is available at ref. 0340 on UNFCCC website

(<http://cdm.unfccc.int/Projects/DB/DNV-CUK1142971997.99/view>)

7. Verification and Certification Statement

SGS United Kingdom Ltd has been contracted by Reliance Industries Ltd. to perform the verification of the emission reductions reported for the CDM project “Reduction in Steam Consumption in Stripper Reboilers Through Process Modifications” UN Reference No. 0340 in the period 15/05/2006 to 03/02/2008.

The verification is based on the validated and registered project design document and the monitoring report for this project. Verification is performed in accordance with section I of Decision 3/CMP.1, and relevant decisions of the CDM EB and CoP/MoP. The scope of this engagement covers the verification and certification of greenhouse gas emission reductions generated by the above project during the above mentioned period, as reported in the Second Monitoring report for “Reduction in Steam Consumption in Stripper Reboilers Through Process Modifications” version 4 dated 17/01/2009.

The management of the Reliance Industries Ltd. is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions on the basis set out within the project Monitoring Report version 4 dated 17/01/2009. Calculation and determination of GHG emission reductions from the project is the responsibility of the management of the “Reduction in Steam Consumption in Stripper Reboilers Through Process Modifications”. The development and maintenance of records and reporting procedures are in accordance with the monitoring report.

It is our responsibility to express an independent GHG verification opinion on the GHG emissions and on the calculation of GHG emission reductions from the project for the period 15/05/2006 to 03/02/2008 based on the reported emission reductions in the monitoring report version 4 dated 17/01/2009 for the same period.

Based on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these, SGS planned and performed our work to obtain the information and explanations that we considered necessary to provide sufficient evidence for us to give reasonable assurance that this reported amount of GHG emission reductions for the period is fairly stated.

SGS confirms that the project is implemented as described in the validated and registered project design documents. Based on the information we have seen and evaluated, we confirm the following:

Project Title:	“Reduction in Steam Consumption in Stripper Reboilers Through Process Modifications”
UNFCCC Reference Number:	UN No. 0340
Registered and Approved PDD Used for Verification:	Version 3, dated 25/02/2006
Methodology Used for Verification:	AM0018, version 01 dated 06/12/2004
Applicable Period:	15/05/2006 to 03/02/2008
Total GHG Emission Reductions Verified:	63,961tC02e

Signed on behalf of the Verification Body by Authorized Signatory

Signature:

Name: Siddharth Yadav

Date: 13th March 2009

8. Document References

- /1/ PDD dated 25/02/2006
- /2/ Monitoring report version 1, dated 15/02/2008
- /3/ First Verification report, dated 24/01/2007
- /4/ AM0018 Version01, Project Methodology.
- /5/ Monitoring report version 4 dated 17/01/2009
- /6/ Emission reduction calculation sheet
- /7/ Calibration Certificate Copies for the monitoring period 15/05/2006 to 03/02/2008 for the below parameters:
- LPG from Stabilizer in CDU-I
 - Naphtha from Stabilizer in CDU-I
 - MP steam to stripper in CDU-I
 - LPG from Stabilizer in CDU-II
 - Naphtha from Stabilizer in CDU-II
 - MP steam to stripper in CDU-II
 - HP Steam Generated
 - RFO to Boilers
 - RFG to Boilers
 - HP Steam Temperature
 - HP Steam Pressure
 - BFW temperature
 - MP Steam Pressure
 - MP Steam Temperature
- /8/ ISO 14001:2004 certificate, valid till 30/04/2009
- /9/ Consent to operate, dated 07/02/2004
- /10/ Trial report dated 5th March 2007
- /11/ Trial period baseline SSCR estimation sheet
- /12/ Trial planning sheet
- /13/ CDM Manual dated 22/01/2007



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