Methane Recovery and Power Generation in a Distillery plant

By GMR Industries Ltd. (GIDL)

(UNFCCC Reference No. 0505)

V Monitoring Report

Version 1.0
Date: 14/05/2009

Monitoring Period:
From: 01/10/2008
To: 31/03/2009
(Inclusive of both days)

GMR Industries Limited (Sugar Division)
Sankili, Regidi, Amadalavalasa Mandal,
Srikakulam District – 532 440
Andhra Pradesh, India

Table of Contents

1. **Introduction** 3
2. **History of CER issuance** 3
3. **Monitoring Plan** 4
4. **GHG Calculations** 8
5. **Reference** 14

1. Introduction

This project activity is based at the distillery unit of integrated sugar complex of GMR Industries Ltd. (GIDL - Sugar Division) at Sankili village, Srikakulam District in the State of Andhra Pradesh. The company belongs to GMR group. The distillery has implemented ISO-9001:2000: system.

This project activity from GIDL entails treatment of high BOD/COD Spent-Wash anaerobically in a closed digester and capturing the Methane generated in a controlled manner. The Methane captured is combusted in a boiler for steam generation and further to generate power through a turbo-generator. The project activity also includes combustion of other GHG neutral biomass residue fuels such as rice-husk to supplement biogas fuel in the boiler. The capacity of the power generation plant is ~1.0 MW.

The purpose of monitoring report is to calculate and clearly demonstrate the GHG emission reduction quantity achieved by this project for periodic verification.

2. History of CER issuance

Issuance No	Period Covered	No of CERs issued
First	01/10/2006 – 31/03/2007	12836
Second	01/04/2007 – 30/09/2007	9550
Third	01/10/2007 – 31/03/2008	Under verification, CERs claimed 18833
Fourth	31/03/2008 – 30/09/2008	Under verification, CERs claimed 8276
Fifth	01/10/2008 – 31/03/09	CERs estimated for this Monitoring period 21967

Project Registration Date: 29/09/2006

Starting date of crediting period (first 7 year crediting period): 01/10/2006

3. Monitoring Plan

The data being monitored as a part of project activity are as follows:

ID number	Data Source	Data variable	Data unit	Measured (m), calculated © or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
1.1	Plant Data	Flow of Spent-Wash in digester	m^3	*m*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	
1.2	Lab test data	Chemical Oxygen Demand of untreated Spent-Wash into the digester	mg/l	*e*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	*Standard "Reflux method" is used for estimation of COD of spent wash following Central Pollution Control Board norms*
1.3	Lab test data	Chemical Oxygen Demand of treated water from digester	mg/l	*e*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	*Standard "Reflux method" is used for estimation of COD of treated water following Central Pollution*

									Control Board norms
1.4	Plant data	Biogas flow into boiler	m3	*m*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	
1.5	Lab test data	%CH4, Volumetric content of Methane in biogas	%	*m*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	*Methane concentration in biogas is measured using "Gas Chromatograph-Thermal Conductivity Detector"*
1.6	Plant data	Pressure of biogas	mm. WC	*m*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	
1.7	Plant data	Temp. of biogas	Deg C	*m*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	
1.8	Plant data	Gross Electricity generated in the power plant	kWh	*m*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	
1.9	Plant data	Auxiliary Electricity Consumption	kWh	*m*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	
1.10	Plant data	Net electricity generation	kWh	*c*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	
1.11	Plant data	Quantity of fossil fuel i combusted in boiler	Tonnes	*m*	*Monthly*	*100%*	*Paper*	*Credit period + 2 yrs*	
1.12	Lab test data	Calorific value of fossil fuel i combusted	kcal/ kg	*e*	*Monthly*	*100%*	*Paper*	*Credit period + 2 yrs*	

1.13	Plant data	Power consumed in equipment in digester plant	kWh	*m*	*Daily*	*100%*	*Paper*	*Credit period + 2 yrs*	
1.14	Plant data	Quantity of digester solid residues generated	tonnes	*m*	*Monthly*	*100%*	*Paper*	*Credit period + 2 yrs*	
1.15	Plant data	Quantity of digester solid residue treated by composting	tonnes	*m*	*Monthly*	*100%*	*Paper*	*Credit period + 2 yrs*	*Total quantity generated of solid residues in digester goes to composting plant*
1.16	Plant data/ IPCC default values	Coefficient of emission for fossil fuel i combusted in boiler	tCO2e/ tonne	*c*	*Monthly*	*100%*	*Paper*	*Credit period + 2 yrs*	*Refer Section E.1.1 for detail formula*
1.17	Plant data	Quantity of biomass residues combusted in boiler for power and steam generation	Tonnes	*m*	*Monthly*	*100%*	*Paper*	*Credit period + 2 yrs*	*From transportation records / purchase invoice copies*

QA/QC Procedures being undertaken for data monitoring

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Table D.3 (ID numbers from 1.1, 1.4, 1.6, 1.7	Low	The data will be collected as part of normal plant level operations. QA/QC requirements consist of cross- checking these with other internal company report.
Table D.3 (ID numbers from 1.2, 1.3	Low	Data are estimated using standard "Reflux method" as per Central Pollution Control Board (CPCB), Government of India norms.
Table D.3 (ID number 1.5	Low	Data is measured using "Gas Chromatograph –Thermal Conductivity Detector" method.
Table D.3 (ID numbers from 1.8- 1.10, 1.11, 1.13	Low	Data is monitored as part of power plant operation and logs are maintained on daily basis; meters are calibrated as per predefined calibration program
Table D.3 (ID number 1.12	Low	Fuel calorific value is lab tested of each stock and a record is maintained to this effect
Table D.3 (ID numbers from 1.14- 1.15	Low	Total solid residues from digester are sent to composting plant. A record for residues generated and sent to compost plant is maintained
Table D.3 (ID numbers 1.16	Low	Data is calculated based on NCV and IPCC default values for emission factor and oxidation factor for fossil fuels

GIDL is an ISO-9001:2000 certified plant and it has well defined monitoring, calibration and recording procedures.

4. GHG Calculations

The GHG calculation for this project is divided in two parts –

- **For Methane Avoidance / Spent wash Treatment part**
- **For Power Generation part**

These are explained in following pages.

For Methane Avoidance / Spent wash Treatment part

As per the methodology AMS IIIH, the emission reductions for the methane avoidance are calculated as

$ER_y = BE_y – (PE_y + L_y)$

BE_y = Baseline emissions for spent wash treatment part
PE_y = Project emissions for spent wash treatment part
L_y = Leakage for spent wash treatment part (No leakages has been identified for the project activity)

Calculation of BE_y i.e. baseline emissions for methane avoidance

Baseline emissions have been calculated in two ways, first based on actual biogas generation and second based on formula as provided in the methodology. Amongst the two values obtained, the least value is taken for emission reduction calculation.

Based on actual generation of biogas in the project activity:

BE_y = (Biogas flow into boiler) * (% CH4, Volumetric content of Methane in biogas) * (Methane Density) * GWP_CH4 / 1000

Results:

BE_y (spent wash treatment) for the six months:

Month	BEy Spent wash treatment Actual (tCO2)
OCT'08	3988
NOV'08	4913
DEC'08	4249
JAN'09	4707
FEB'09	4941
MAR'09	874
Total	23672

Based on the formula as described in the methodology:

$$ME_{y,ww,untreated} = Q_{y,ww} * COD_{y,ww,untreated} * B_{o,ww} * MCF_{ww,untreated}$$

Results:

Month	BEy Spent wash treatment As per Meth formula (tCO2)
OCT'08	3487
NOV'08	4531
DEC'08	3896
JAN'09	4165
FEB'09	4187
MAR'09	803
Total	21069

Out of the above values, conservative figure considered for baseline emissions is 21069 tCO2e.

Calculate PE_y i.e. Project emissions for Methane Avoidance

Project emissions are on account of power consumption in the digester plant and dissolved methane in the treated waste water.

Project Emissions due to Power Consumption in digester plant

PE_y (Power consumption in digester plant) = (Power Consumption in digester plant) * (GEF) / 1000

Results:

PE_y (power consumption in digester plant) for six months:

Month	Power Consumption in treatment process
OCT'08	23
NOV'08	24
DEC'08	24
JAN'09	21
FEB'09	20
MAR'09	11
Total	123

Project emissions for Dissolved Methane in Treated waste water

$PE_{y, dissolved} = Q_{y, ww} * [CH4]_{y, ww, treated} * GWP\_CH4$

Results:

Month	Dissolved Methane in Treated Waste water(tCO2)
OCT'08	22
NOV'08	28
DEC'08	23
JAN'09	25
FEB'09	25
MAR'09	5
Total	127

Calculate L_y i.e. Project Leakages

Leakages are zero. (Refer section E.1.1 of the registered PDD)

For Power Generation

This calculation is based on AMS ID
$ER_y = BE_y – (PE_y + L_y)$

Baseline emissions:
BE_y (Power Generation) = (Gross Electricity Generated in Power Plant) * GEF /1000

Results:
BE_y (power generation) for the six months:

Month	Baseline Emissions Power Generation (tCO2)
OCT'08	133
NOV'08	319
DEC'08	315
JAN'09	380
FEB'09	330
MAR'09	70
Total	1547

Project emissions due to auxiliary power consumption:
PE_y (Auxiliary electricity consumption in the power plant) = (Auxiliary electricity consumption in the power plant) * (GEF) / 1000

Results:
PE_y (Auxiliary electricity consumption) for six months:

Month	Project Emissions Power Consumption in combustion process (tCO2)
OCT'08	74
NOV'08	80
DEC'08	76
JAN'09	81
FEB'09	71
MAR'09	17
Total	398

Project emissions due to fossil fuel combustion:
$PE_{y, FF}$ (Fossil fuel combustion) = (fossil fuel consumption) * (Net calorific value of fossil fuel) * (IPCC default oxidation factor) * (Emission factor for sub-bituminous coal) * 4.187 / 1000000

Fossil fuel was not combusted during the monitoring period hence there are no project emissions

Emission reductions can be summarized as below:

Month	Baseline Emissions (tCO2e)		Project Emissions (tCO2e)				Emission Reductions (tCO2e)
	Methane Avoidance	Power Generation	Power Consumption in treatment process	Power Consumption in combustion process	Fossil fuel Combustion	Dissolved Methane	
OCT'08	3487	133	23	74	0	22	**3500**
NOV'08	4531	319	24	80	0	28	**4718**
DEC'08	3896	315	24	76	0	23	**4089**
JAN'09	4165	380	21	81	0	25	**4418**
FEB'09	4187	330	20	71	0	25	**4402**
MAR'09	803	70	11	17	0	5	**840**
Total							**21967**

5. Reference

Project Design Document:

"Methane recovery and power generation in a distillery plant" by GMR Industries Ltd. (GIDL); UNFCCC reference number - 0505

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http://cdm.unfccc.int/UserManagement/FileStorage/PYKWM3K4AATF0Q2PNQZ46DEHNXT1VA

Revised Monitoring plan

Revision: 01/11/07

http://cdm.unfccc.int/Projects/DB/SGS- UKL1152270393.27/MonitoringPlanRevisions/01/RevisedMonitoringPlan

Methodologies

***AMS - III.H. Methane Recovery in Wastewater Treatment*, Version 01, Scope 13,15, 03 March 2006**

http://cdm.unfccc.int/UserManagement/FileStorage/CDM_AMSIV7OBP5KXY3HNLLBAAVR1AS8G8IKKQ

***AMS - I.D. 'Grid connected renewable electricity generation',* Version 08, Scope 1, 03 March 2006**

http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_88PZMJZZR5KRJ6L9V7AXGGWHG7W2HH