

MONTHLY AGGREGATED DATA

Date	Raw Wastewater fed to digester					Effluent digester	Biogas Fed to Burner (Nm3 - wet basis)						Total Biogas to Burner
	Flow	Operating time	Flowrate avg.	COD	Ambient temp.	COD	Sub-total meters (Flow Fac.1), GFM-001			Sub-total meters (Flow Fac.2), GFM-002			Flow rate
	(m3/month)	(hrs./month)	(m3/hr)	(kg. / m3)	(degree C)	(kg. / m3)	(Nm3/month)	Operating time (hrs.)	(Nm3/hr)	(Nm3/month)	Operating time (hrs.)	(Nm3/hr)	(Nm3/month - wet basis)
APRIL 2009	-												
MAY 2009	96,976	443	219	16	26	3.6	97,452	192	509	283,033	406	698	380,485
JUNE 2009	152,672	667	229	20	28	5.9	350,167	580	-	613,894	704	-	964,061
JULY 2009	139,289	660	211	18	27	5.8	13,192	22	-	21,586	24	-	34,777
AUG 2009	129,289	670	193	21	27	5.4	-	-	-	-	-	-	-
SEP 2009	117,350	652	180	19	26	4.8	-	-	-	-	-	-	-
OCT 2009	105,889	582	182	17	27	3.6	-	-	-	-	-	-	-
NOV 2009	135,621	646	210	18	26	4.9	-	-	-	-	-	-	-
TOTAL	877,086	4,320	203	18.42	27	4.9	460,811	793	581	918,513	1,134	810.0	1,379,324

Date	Biogas Fed to Flare, GFM-007 (Nm3 - wet basis)				Hour Counter of Flame at flare (cumulative hrs)	Flame operating hours (hrs/month)	Total Biogas from digester	Total Biogas from digester	Total Biogas from digester	Total biogas to burners	Methane content in biogas	Methane content in biogas	T Biogas
	Flow	Operating time	Flow rate	Flare temp			(Nm3/dav)	(Nm3/dav)	(Nm3/dav)	(Nm3/dav)			Discharge Blower
	(Nm3/month)	(hrs./day)	(Nm3/hr)	(C)			M 001 + 002 + 0	(GFM-008) TOTAL METER	(GFM-001 + GFM-002) SUB-TOTAL METERS	(GFM-003 - GFM- 006) INDIVIDUAL METERS	(% dry basis)	(m3CH4/m3biogas)	(C)
APRIL 2009													
MAY 2009	703	2.6	270	623	0	2.11	381,188	-	380,485	-	49.5	0.49	64
JUNE 2009	0	0	-	-	0	0.00	964,061	-	964,061	928,262	48.4	0.48	62
JULY 2009	0	0	-	-	0	0.00	34,777	853,436	34,777	985,964	48.2	0.48	64
AUG 2009	0	0	-	-	0	0.00	0	898,723	-	874,234	48.3	0.48	65
SEP 2009	0	0	-	-	0	0.00	0	706,168	-	712,138	48.5	0.49	62
OCT 2009	0	0	-	-	0	0.00	-	631,666	-	683,565	44.3	0.43	62
NOV 2009	0	0	-	-	0	0.00	0	760,497	-	763,324	51.9	0.52	63
TOTAL	703	3	270	623	0	2.11	1,380,027	3,850,490	1,379,324	4,947,487	48.4	0.48	63

Date	Pressure of Biogas(sp.)	Pressure of Biogas(avr.)	Electric consump. (Biogas plant)	Level Open lagoon (m.)						Amount of Sludge Removed	COD of Sludge Removed	Nitrogen Content in Sludge Removed	Amount of burner stack gas	Fraction of Methane content
	(m.bar)	(m.bar)	(KwHr)	1	3	4	5	6	7	(kg Sludge/month)	(kg COD/kg Sludge)	(kg Nitrogen/kg Sludge)	Nm³/yr	WCH4_stack (dry basis) m³CH4/m³ stack gas
APRIL 2009				4.5	4.5	4.4	4.3	4.5	4.6	-	0	0	0	
MAY 2009	400	397	32,480	4.5	4.6	4.6	4.7	4.6	4.7	-	0	0	0	5.23E-05
JUNE 2009	447	457	67,296	4.6	4.7	4.7	4.7	4.6	4.7	-	0	0	0	5.23E-05
JULY 2009	434	429	69,856	4.6	4.6	4.4	4.4	4.6	4.7	-	0	0	0	5.23E-05
AUG 2009	450	454	57,152	4.6	4.6	4.4	4.4	4.6	4.7	-	0	0	0	4.11E-05
SEP 2009	452	457	50,918	4.6	4.5	4.3	4.3	4.6	4.7	-	0	0	0	4.11E-05
OCT 2009	448	456	44,186	4.5	4.5	4.4	4.4	4.5	4.7	24,590	0.100	0.003	27,342,600	4.11E-05
NOV 2009	458	468	45,504	4.5	4.5	4.5	4.5	4.6	4.7	111,780	0.102	0.003	30,532,960	1.52E-05
TOTAL	441.3	446	367,392	4.5	4.6	4.4	4.5	4.6	4.7	136,370	0.101	0.003	217,155,037	4.22E-05

BASELINE EMISSIONS CALCULATIONS

Methodology and Tool Applied

- 1. AM0013 version 4
- 2. AMS-I.C version 12

As per Registered-PDD of the Project, the Baseline Emissions are;

B1: BE_Lagoon,y
- As per requirement of AM0013 version 4, the most conservative result between BE_Lagoon_Monitored and BE_Lagoon_Theoretical **MUST** be selected
B1-1: Calcualte BE_Lagoon_Monitored
B1-2: Calcualte BE_Lagoon_Theoretical

B2: BE_Fuel_Oil,y

Baseline Emissions [BEy] = [BE_Lagoon,y] + [BE_Fuel_Oil,y]

B1: BASELINE EMISSION FROM LAGOON, [BE_Lagoon,y]

B1-1: BE_Lagoon_Monitored

MONITORED PERIOD	BIOGAS VOLUME FLOWRATE		BIOGAS COMPOSITION		Methane Properties	MASS FLOWRATE OF CH4			BASELINE EMISSION		
	Biogas fed to burners	Biogas fed to flare	Composition of Dry Biogas		[CH4 density]	CH4 fed to burners	CH4 fed to flare	Total mass flowrate of CH4 generated from digester	Baseline Emission of biogas fed to burners [BE_biogas_burners]	Baseline Emission of biogas fed to flare [BE_biogas_flare]	Total Baseline Emission from biogas captured [BE_lagoon_monitored]
	Nm3 (dry basis)	Nm3 (dry basis)	% CH4 (Dry Basis)	% N	kg CH4/ m3 dry CH4	Kg CH4	Kg CH4	Kg CH4	tCO2e	tCO2e	tCO2e
APR 2009	0	0	0.0%	0.0%	0	0	0	0	0	0	0
MAY 2009	311,440	573	49.5%	50.5%	0.716	110,357	203	110,560	2,317	4	2,321
JUN 2009	887,699	0	48.4%	51.6%	0.716	307,465	0	307,465	6,456	0	6,456
JUL 2009	877,777	0	48.2%	51.8%	0.716	303,129	0	303,129	6,365	0	6,365
AUG 2009	864,585	0	48.3%	51.7%	0.716	299,197	0	299,197	6,283	0	6,283
SEP 2009	712,138	0	48.5%	51.5%	0.716	247,458	0	247,458	5,196	0	5,196
OCT 2009	683,565	0	42.9%	57.1%	0.716	209,959	0	209,959	4,409	0	4,409
NOV 2009	763,324	0	51.9%	48.1%	0.716	283,417	0	283,417	5,951	0	5,951
TOTAL/AVERAGE	5,100,527	573	48.2%	51.8%	0.7160	1,760,983	203	1,761,186	36,977	4	36,981

Constant parameters used in calculation

No.	Parameters	Symbols	Units	Value	Remark
1	Atmosphere pressure	P_atm	Pascal (Pa)	101,325	sourced from the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 01)"
2	Molecular Mass of H2O	MM_H2O	kg/kmol	18	
3	Molecular Mass of CH4	MM_CH4	kg/kmol	16	
4	Molecular Mass of N2	MM_N2	kg/kmol	28	
5	Universal ideal gases constant	Ru	Pa.m3/kmol.K	8,314	
6	Referent pessure at Normal Condition	P_Normal	Pascal (Pa)	101,325	
7	Referent temperature at Normal Condition	T_Normal	C	0	
8	Global Warming Potential of CH4	GWP_CH4	tCO2e/tCH4	21	

B1-2: BE_Lagoon_theoretical

BE_Lagoon_Theoretical = [BE_Total_Emission_Lagoon,m] - [PE_Phy_Leakage,m]

BE_Total_Emission_Lagoon,m

MONITORED PERIOD	VARIABLE PARAMETERS											
	COD_conc_in, baseline,m	F_digester	COD_baseline, m	Ambient Temp	F_t,m	MCF_baseline, m	COD_available,m-1	MCF_baseline,m-1	Q_sludge,m-1	COD_conc_sludge,m-1	COD_carryover,m-1	COD_available,m
	kgCOD/m3	m3 wastewater	kg COD	Kelvin	fraction	fraction	(kgCOD)	(fraction)	(kg)	(kgCOD/kg sludge)	(kg COD)	(kgCOD)
APR 2009	0.00	0	0	0	0.00	0.00	0	0	0	0	0	0
MAY 2009	15.98	96,976	1,536,990	299	0.70	0.31	0	0.00	0	0	0	1,536,990
JUN 2009	20.00	152,672	3,029,623	301	0.83	0.37	1,536,990	0.31	0	0	1,054,956	4,084,579
JUL 2009	18.45	139,289	2,549,118	300	0.79	0.35	4,084,579	0.37	0	0	2,568,252	5,117,370
AUG 2009	20.66	129,289	2,649,518	300	0.80	0.35	5,117,370	0.35	0	0	3,314,362	5,963,881
SEP 2009	18.71	117,350	2,177,782	300	0.74	0.33	5,963,881	0.35	0	0	3,847,270	6,025,052
OCT 2009	17.04	105,889	1,789,610	300	0.78	0.35	6,025,052	0.33	24,590	0.100	4,028,465	5,818,075
NOV 2009	18.10	135,621	2,434,900	299	0.71	0.31	5,818,075	0.35	111,780	0.102	3,784,625	6,219,525
TOTAL/AVERAGE	18.42	877,086	16,167,542	300	0.77	0.34	28,545,946	0.30	136,370	0.101	18,597,929	34,765,472

Constant parameters used in calculation

No.	Parameters	Symbols	Units	Value	Remark
1	COD concentration of final effluent in baseline	COD_conc_out, baseline,m	kg COD/m3	0.12	Thai Government Regulation (maximum), as per Registered PDD
2	Adjust factor (in case that there is an effluent from lagoon in baseline)	AD	(fraction)	0.992	Validated value, which was validated by DOE in validation process
3	Activation energy constant	E	Calories/mol	15,175	AM0013
4	Reference temperature	T1	Kelvin	303.16	AM0013
5	Ideal gas constant	R	Calories/K.mol	1.987	
6	Fraction of anaerobic degradation due to the depth of lagoon in baseline	F_d	(fraction)	0.5	AM0013 for the lagoon depth of 1 - 5 m
7	Model correlation factor	N/A	(fraction)	0.89	AM0013
8	Maximum methane producing capacity	Bo	(fraction)	0.21	AM0013
9	Global Warming Potential of CH4	GWP_CH4	tCO2e/tCH4	21	IPCC Default Value

PE_Phy_Leakage,m

MONITORED PERIOD	BIOGAS VOLUME FLOWRATE		BIOGAS COMPOSITION		Methane Properties	MASS FLOWRATE OF CH4			PHYSICAL LEAKAGE
	Biogas fed to burners	Biogas fed to flare	Composition of Dry Biogas		[CH4 density]	CH4 fed to burners	CH4 fed to flare	Total mass flowrate of CH4 generated from digester	PE_Phy_Leakage,m
	Nm3 (dry basis)	Nm3 (dry basis)	% CH4 (Dry Basis)	% N	kg CH4/ m3 wet CH4	Kg CH4	Kg CH4	Kg CH4	tCO2e/month
APR 2009	0	0	0.0%	0.0%	0	0	0	0	0
MAY 2009	384,731	713	49.5%	50.5%	0.716	136,328	253	136,581	431
JUN 2009	1,003,954	0	48.4%	51.6%	0.716	347,731	0	347,731	1,096
JUL 2009	996,077	0	48.2%	51.8%	0.716	343,982	0	343,982	1,084
AUG 2009	885,087	0	48.3%	51.7%	0.716	306,292	0	306,292	965
SEP 2009	712,138	0	48.5%	51.5%	0.716	247,458	0	247,458	780
OCT 2009	683,565	0	42.9%	57.1%	0.716	209,959	0	209,959	662
NOV 2009	763,324	0	51.9%	48.1%	0.716	283,417	0	283,417	893
TOTAL/AVERAGE	5,428,876	713	48.2%	51.8%	0.7160	1,875,168	253	1,875,421	5,911

Constant parameters used in calculation					
No.	Parameters	Symbols	Units	Value	Remark
1	Physical leakage from anaerobic digester	Physical laekage	(fraction)	0.15	Default value, as per AM0013 version 4.
2	Global Warming Potential of CH4	GWP_CH4	tCO2e/tCH4	21	IPCC Defalut Value

BE_Lagoon_Theoretical			
MONITORED PERIOD	BE_Total_Emission_Lagoon,m	PE_Phy_Leakage,m	BE_Lagoon_Theoretical
	tCO2e/month	tCO2e/month	tCO2e/month
APR 2009	0	0	0
MAY 2009	2,125	431	1,694
JUN 2009	6,687	1,096	5,591
JUL 2009	7,951	1,084	6,867
AUG 2009	9,334	965	8,369
SEP 2009	8,794	780	8,014
OCT 2009	8,917	662	8,255
NOV 2009	8,633	893	7,740
TOTAL/AVERAGE	52,441	5,911	46,530

Summary of Baseline Emission from Lagoon

As per the requirement of AM0013 version 4, the most conservative result between BE_monitored and BE_Theoretical must be selected

MONITORED PERIOD	Total Baseline Emission from biogas captured [BE_Lagoon_Monitored]	Total Baseline Emission from biogas captured [BE_Lagoon_Theoretical]
	tCO2e	tCO2e
APR 2009	0	0
MAY 2009	2,321	1,694
JUN 2009	6,456	5,591
JUL 2009	6,365	6,867
AUG 2009	6,283	8,369
SEP 2009	5,196	8,014
OCT 2009	4,409	8,255
NOV 2009	5,951	7,740
TOTAL/AVERAGE	36,981	46,530

BE_Lagoon,m = MIN {BE_lagoon_monitored, BE_lagoon_Theoretical} = 36,981 tCO2e <<<< BE_Lagoon_Monitored is selected

B2: BASELINE EMISSION FROM FUEL OIL, [BE_Fuel_Oil,y]

MONITORED PERIOD	CH4 FED TO BURNERS		ENERGY DISPLACED AT BURNERS	BASELINE EMISSION
	Mass flow rate	Volume flowrate (at normal condition)	Total Energy contained in biogas (or CH4) burnt at burners	Baseline Emission from the combustion of fuel oil [BE_Fuel_Oil]
	Kg CH4	Nm3 CH4	TJ/month	tCO2/month
APR 2009	0	0	0	0
MAY 2009	110,357	154,130	5.6	419
JUN 2009	307,465	429,421	15.5	1,170
JUL 2009	303,129	423,364	15.3	1,153
AUG 2009	299,197	417,873	15.1	1,138
SEP 2009	247,458	345,612	12.5	941
OCT 2009	209,959	293,238	10.6	799
NOV 2009	283,417	395,834	14.3	1,078
TOTAL/AVERAGE	1,760,983	2,459,473	89	6,698

Constant parameters used in calculation					
No.	Parameters	Symbols	Units	Value	Remark
1	Heating value of CH4 at normal condition	LHV_CH4	TJ/Nm3.CH4	0.00003609	IPCC default value of CH4 heating value is 50.4 TJ/Gg. 2006 IPCC Guideline, Table 1.2
2	Densitiy of CH4 at normal condition	r_CH4_normal	kg/Nm3.CH4	0.716	A default CH4 density is applied, as per DNV recommendation. This value can be sourced from the "Flaring Tool" version 1
3	Reference temperature at normal condition	T_normal	C	0	
4	Reference pressure at normal condition	P_normal	Pa	101,325	Registered PDD used a defaul value of 77.4. But, to be conservative, a lower value of 75.5 tCO2e/TJ is applied. Sourced from Table 2.2 , Chapter 1, Volume 2 of 2006 IPCC Guidelines
5	CO2 emission factor of using fuel oil (in the absence of project)	EF_CO2_Fuel	tCO2/TJ	75.5	

SUMMARY OF BASELINE EMISSIONS OF THE PROJECT [BE_LAGOON + BE_FUEL_OIL]

MONITORED PERIOD	BASELINE EMISSION OF THE PROJECT		
	BE_Lagoon,y	BE_Fuel_Oil,y	BEy
	tCO2/month	tCO2/month	tCO2/month
APR 2009	0	0	0
MAY 2009	2,321	419	2,740
JUN 2009	6,456	1,170	7,626
JUL 2009	6,365	1,153	7,518
AUG 2009	6,283	1,138	7,421
SEP 2009	5,196	941	6,137
OCT 2009	4,409	799	5,208
NOV 2009	5,951	1,078	7,029
TOTAL/AVERAGE	36,981	6,698	43,679

PROJECT EMISSIONS CALCULATIONS

Methodology and Tool Applied

- 1. AM0013 version 4
- 2. AMS-I.C version 12
- 3. Tool to determine project emissions from flaring gases containing methane

As per Registered-PDD of the Project, the Project Emissions are;

P1: Project Emission From Lagoon [PE_Lagoon,y]

P2: Project Emission From Physical Leakage of Digester [PE_Phy_Leakage,y]

P3: Project Emission From Land Application of Sludge [PE_Sludge,y]

P4: Project Emission From the Consumption of energy on the account of the project activity [PE_Energy_Cons,y]

P5: Project Emission From Incomplete Combustion of Biogas in the Flare and Boiler [PE_Stack,y]

Project Emissions [PEy] = [PE_Lagoon,y] + [PE_Phy_Leakage,y] + [PE_Sludge,y] + [PE_Energy_Cons,y] + [PE_Stack,y]

P1: PE_Lagoon,y

MONITORED PERIOD	VARIABLE PARAMETERS			PROJECT EMISSION
	F_dig_out,m	COD_conc_dig_out,m	MCF_baseline,m	PE_Lagoon,y
	m3/month	kgCOD/m3	fraction	tCO2/month
APR 2009	0	0.00	0.00	0
MAY 2009	96,976	3.62	0.31	486
JUN 2009	152,672	5.93	0.37	1,483
JUL 2009	139,289	5.80	0.35	1,256
AUG 2009	129,289	5.36	0.35	1,084
SEP 2009	117,350	4.80	0.33	823
OCT 2009	105,889	3.59	0.35	583
NOV 2009	135,621	4.86	0.31	915
TOTAL/AVERAGE	877,086	4.85	0.34	6,630

Constant parameters used in calculation

No.	Parameters	Symbols	Units	Value	Remark
1	Maximum methane producing capacity	Bo	fraction	0.21	IPCC Default Value
2	Global Warming Potential of CH4	GWP_CH4	tCO2e/tCH4	21	IPCC Default Value

P2: PE_Phy_Leakage,y

MONITORED PERIOD	BIOGAS VOLUME FLOWRATE		BIOGAS COMPOSITION		Methane Properties	MASS FLOWRATE OF CH4			PROJECT EMISSION
	Biogas fed to burners	Biogas fed to flare	Composition of Dry Biogas		[CH4 density]	CH4 fed to burners	CH4 fed to flare	Total mass flowrate of CH4 generated from digester	PE_Phy_Leakage,y
	Nm3 (dry basis)		% CH4	% N	kg CH4/ m3 dry CH4	Kg CH4	Kg CH4	Kg CH4	tCO2/month
APR 2009	0	0	0%	0%	0	0	0	0	0
MAY 2009	384,731	713	49%	51%	0.716	136,328	253	136,581	431
JUN 2009	1,003,954	0	48%	52%	0.716	347,731	0	347,731	1,096
JUL 2009	996,077	0	48%	52%	0.716	343,982	0	343,982	1,084
AUG 2009	885,087	0	48%	52%	0.716	306,292	0	306,292	965
SEP 2009	712,138	0	49%	51%	0.716	247,458	0	247,458	780
OCT 2009	683,565	0	43%	57%	0.716	209,959	0	209,959	662
NOV 2009	763,324	0	52%	48%	0.716	283,417	0	283,417	893
TOTAL/AVERAGE	5,428,876	713	48%	52%	0.7160	1,875,168	253	1,875,421	5,911

Constant parameters used in calculation

No.	Parameters	Symbols	Units	Value	Remark
1	Atmosphere pressure	P_atm	Pascal (Pa)	101,325	Sourced from the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 01)"
2	Molecular Mass of H2O	MM_H2O	kg/kmol	18	
3	Molecular Mass of CH4	MM_CH4	kg/kmol	16	
4	Molecular Mass of N2	MM_N2	kg/kmol	28	
5	Universal ideal gases constant	Ru	Pa.m3/kmol.K	8,314	
6	Reference perssure at Normal Condition	P_Normal	Pascal (Pa)	101,325	
7	Reference temperature at Normal Condition	T_Normal	C	0	
8	Global Warming Potential of CH4	GWP_CH4	tCO2e/tCH4	21	
9	Physical leakage from anaerobic digester	Physical laekage	fraction	0.15	

P3: PE_Sludge,y

MONITORED PERIOD	VARIABLE PARAMETERS			PROJECT EMISSION		
	Amount of sludge removed	COD_Sludge,y	Nitrogen content of sludge	PE_Sludge_CH4 Emission	PE_Sludge_N2O Emission	PE_sludge_y
	tSludge	tCOD / tSludge	kg.N/kg.sludge	tCO2/month	tCO2/month	tCO2/month
APR 2009	0	0	0	0	0	0
MAY 2009	0	0	0	0	0	0
JUN 2009	0	0	0	0	0	0
JUL 2009	0	0	0	0	0	0
AUG 2009	0	0	0	0	0	0
SEP 2009	0	0	0	0	0	0
OCT 2009	25	0.10	0.003	0.54	0.0	1
NOV 2009	112	0.10	0.003	2.51	0.2	3
TOTAL/AVERAGE	136	0.10	0.003	3.05	0.2	4.0

Constant parameters used in calculation

No.	Parameters	Symbols	Units	Value	Remark
1	Maximum methane producing capacity	Bo	tCH4/tCOD	0.21	AM0013
2	Methane correction factor of sludge	MCF_la	fraction	0.05	AM0013
3	Global Warming Potential of CH4	GWP_CH4	tCO2e/tCH4	21	IPCC Default Value
4	Emission Factor of nitrogen from sludge applied to land	EF_N2O	kg.N2O/kg.N	0.016	AM0013
5	Global Warming Potential of N2O	GWP_N2O	tCO2e/tN2O	310	IPCC Default Value

4. PE_Energy_Cons,y

MONITORED PERIOD	VARIABLE PAREMETERS			PROJECT EMISSION
	Electricity consumption of biogas plant Q_Elect_Cons,y	Electricity consumption in decanter system	Fuel Oil consumption of biogas plant Q_Fuel_cons,y	PE_Energy_Cons,y
	kWh/month	kWh/month	TJ/month	tCO2/month
APR 2009	1,077	61,380	0	36.0
MAY 2009	33,130	63,426	0	56.0
JUN 2009	68,642	61,380	0	75.0
JUL 2009	71,253	63,426	0	78.0
AUG 2009	58,295	63,426	0	71.0
SEP 2009	51,937	61,380	0	66.0
OCT 2009	45,069	63,426	0	63.0
NOV 2009	46,414	61,380	0	63.0
TOTAL/AVERAGE	375,817	499,224	0	508.0

Constant parameters used in calculation

No.	Parameters	Symbols	Units	Value	Remark
1	Thailand grid emission factor	EF_CO2_Elect	tCO2/MWh	0.5756	Refer to sheet Thailand Grid Emission Factor calculation
2	Emission factor of fuel oil	EF_CO2_Fuel	tCO2e/TJ	77.4	Registered PDD

5. PE_Stack,y

MONITORED PERIOD	MASS FLOWRATE OF CH4						PROJECT EMISSION		
	CH4 fed to burners	CH4 fed to flare					PE_Stack_Burners,y	PE_Stack_Flare,y	PE_Stack,y
		T_Flare >500 C		T_Flare <500 C	No. T_Flare data	Total			
	Kg CH4	Kg CH4/month	T_flare (DegC)	Kg CH4/month	Kg CH4/month	Kg CH4/month	tCO2e/month	tCO2e/month	tCO2e/month
APR 2009	0	0	0	0	0	0	0	0	0
MAY 2009	136,328	253	623	0	0	253	10	3	13
JUN 2009	347,731	0	-	0	0	0	26	0	26
JUL 2009	343,982	0	-	0	0	0	25	0	25
AUG 2009	306,292	0	-	0	0	0	33	0	33
SEP 2009	247,458	0	-	0	0	0	27	0	27
OCT 2009	209,959	0	-	0	0	0	23	0	23
NOV 2009	283,417	0	-	0	0	0	6	0	6
TOTAL/AVERAGE	1,875,168	253	623	0	0	253	150	3	153

Constant parameters used in calculation

No.	Parameters	Symbols	Units	Value	Remark
1	Combustion efficiency of burners during (May to July, 2009)	CE_Burners	(fraction)	0.997	Measured
2	Combustion efficiency of burners during (August to October, 2009)	CE_Burners	(fraction)	0.995	Measured
3	Combustion efficiency of burners during (November, 2009)	CE_Burners	(fraction)	0.999	Measured
4	Combustion efficiency of flare at T_flare > 500 C	CE_Flare@>500C	fraction	0.5	As per "Tool to determine project emissions from flaring gases containing methane"
5	Combustion efficiency of flare at T_flare < 500 C	CE_Flare@<500C	fraction	0	Ditto
6	Combustion efficiency of flare at no data of T_flare	CE_Flare@ no T_Flare	fraction	0	Ditto
7	Global Warming Potential of CH4	GWP_CH4	tCO2e/tCH4	21	IPCC Default Value

SUMMARY OF PROJECT EMISSIONS [PEy]

MONITORED PERIOD	PROJECT EMISSIONS					
	PE_Lagoon,y	PE_Phy_Leakage,y	PE_sludge_y	PE_Energy_Cons,y	PE_Stack,y	PEy
	tCO2/month	tCO2/month	tCO2/month	tCO2/month	tCO2/month	tCO2/month
APR 2009	0		0	36	0	36
MAY 2009	486		0	56	13	555
JUN 2009	1,483		0	75	26	1,584
JUL 2009	1,256		0	78	25	1,359
AUG 2009	1,084		0	71	33	1,188
SEP 2009	823		0	66	27	916
OCT 2009	583		1.0	63	23	670
NOV 2009	915		3.0	63	6	987
TOTAL/AVERAGE	6,630		4.0	508	153	7,295

EMISSION REDUCTION SUMMARY

$$\text{Emission Reduction (ERy)} = [\text{BEy}] - [\text{PEy}] - [\text{Leakage}]$$

Where;

$$\text{Baseline Emissions [BEy]} = [\text{BE_Lagoon,y}] + [\text{BE_Fuel_Oil,y}]$$

$$\text{Project Emissions [PEy]} = [\text{PE_Lagoon,y}] + [\text{PE_Phy_Leakage,y}] + [\text{PE_Sludge,y}] + [\text{PE_Energy_Cons,y}] + [\text{PE_Stack,y}][\text{PEy}]$$

$$\text{Leakage [LEy]} = [0 \text{ or Zero}] \text{ (As per AM0013 version 4 considers that "No leakage is associated with the project activity")}$$

MONITORED PERIOD	BASELINE EMISSIONS		PROJECT EMISSION					EMISSION REDUCTION
	BE_Lagoon,y	BE_Fuel_Oil,y	PE_Lagoon,y	PE_Phy_Leakage,y	PE_Sludge,y	PE_Energy_Cons,y	PE_Stack,y	CERs
	tCO2/month	tCO2/month	tCO2/month	tCO2/month	tCO2/month	tCO2/month	tCO2/month	tCO2/month
APR 2009	0	0	0	0	0	36	0	-36
MAY 2009	2,321	419	486	0	0	56	13	2,185
JUN 2009	6,456	1,170	1,483	0	0	75	26	6,042
JUL 2009	6,365	1,153	1,256	0	0	78	25	6,159
AUG 2009	6,283	1,138	1,084	0	0	71	33	6,233
SEP 2009	5,196	941	823	0	0	66	27	5,221
OCT 2009	4,409	799	583	0	1	63	23	4,538
NOV 2009	5,951	1,078	915	0	3	63	6	6,042
SUB-TOTAL	36,981	6,698	6,630	0	4	508	153	36,384
TOTAL	43,679		7,295					36,384

As per a resolution on I-DEV0319, data to be used for the deviation period (15/04/2009 - 01/07/2009) and period immediately following the deviation periods are as follows;

Period (i): 15 April 2009 - 11 May 2009

Meters in place: Sub-total meters GFM-001 and GFM-002 and flare meter GFM-007

No biogas production was recorded during this period due to plant shutdown. No provision for deviation is required during this period

Period (ii): 12 May 2009 - 31 May 2009

Meters in place: Sub-total meters GFM-001 and GFM-002 and flare meter GFM-007

It is suggested that the biogas flow between 12 May 2009 and 31 May 2009 will be based the actual measurement of the sub-total meters GFM-001 and GFM-002 and flare meter GFM-007, which were properly calibrated. For the readings of GFM-002 and GFM-007 that were falling in the period(s) that calibration of equipment was delayed from calibration frequency requirement, they were rectified in as per instruction provided in EB52 Annex60.

Period (iii): 1 June 2009 - 1 July 2009 (end of deviation period)

Meters in place: Individual meters GFM-003, GFM-004, GFM-005, GFM-006, Sub-total meters GFM-001 and GFM-002 and flare meter GFM-007.

The PP will take this in to account by taking the lowest of the readings from the "Total of two sub-total meters(GFM-001 and GFM-002)" and the "Total of the four individual meters (GFM-003 to GFM-006) for BE calculation. And, for PE calculation, the highest reading will be selected.

Period (iv): 2 July 2009 - 10 August 2009 (non-deviation period)

Meters in place: Individual meters GFM-003, GFM-004, GFM-005, GFM-006, flare meter GFM-007 and total meter GFM-008.

The project participant will take the lowest of the readings from the "Total meter (GFM-008)" and the "Total of the four individual meters (GFM-003 and GFM-006) for BE calculation. And, for PE calculation, the highest reading will be selected.

Daily Summary

[illegible]

1-May-09	0	0	0	0	Period (i)
2-May-09	0	0	0	0	
3-May-09	0	0	0	0	
4-May-09	0	0	0	0	
5-May-09	0	0	0	0	
6-May-09	0	0	0	0	
7-May-09	0	0	0	0	
8-May-09	0	0	0	0	
9-May-09	0	0	0	0	
10-May-09	0	0	0	0	
11-May-09	0	0	0	0	
12-May-09	0	251	0	259	Period (ii)
13-May-09	11,578	441	11,931	454	
14-May-09	8,814	0	9,082	0	
15-May-09	13,820	0	14,241	0	
16-May-09	13,306	0	13,711	0	
17-May-09	5,774	0	5,949	0	
18-May-09	10,240	0	10,552	0	
19-May-09	8,040	0	8,284	0	
20-May-09	20,260	0	20,756	0	
21-May-09	21,747	0	22,141	0	
22-May-09	26,277	0	26,836	0	
23-May-09	21,277	0	21,724	0	
24-May-09	27,920	0	28,482	0	
25-May-09	26,427	0	26,883	0	
26-May-09	19,871	0	20,365	0	
27-May-09	29,742	0	30,370	0	
28-May-09	24,798	0	25,328	0	
29-May-09	30,031	0	30,630	0	
30-May-09	26,410	0	26,921	0	
31-May-09	29,908	0	30,543	0	
MAY 2009	376,240	692	384,731	713	
1-Jun-09	20,969	0	24,882	0	Period (iii)
2-Jun-09	22,246	0	22,760	0	
3-Jun-09	23,972	0	30,906	0	
4-Jun-09	13,786	0	23,809	0	
5-Jun-09	21,127	0	31,800	0	
6-Jun-09	27,158	0	34,571	0	
7-Jun-09	27,296	0	36,262	0	
8-Jun-09	34,064	0	39,240	0	
9-Jun-09	21,163	0	24,368	0	
10-Jun-09	33,853	0	35,003	0	
11-Jun-09	32,240	0	33,717	0	
12-Jun-09	28,994	0	30,756	0	
13-Jun-09	25,189	0	26,166	0	
14-Jun-09	33,280	0	34,297	0	
15-Jun-09	32,299	0	34,945	0	
16-Jun-09	34,992	0	37,131	0	
17-Jun-09	39,739	0	40,467	0	
18-Jun-09	33,334	0	36,336	0	
19-Jun-09	36,091	0	36,873	0	
20-Jun-09	36,712	0	38,585	0	
21-Jun-09	36,788	0	37,700	0	
22-Jun-09	28,937	0	31,325	0	
23-Jun-09	41,221	0	44,895	0	
24-Jun-09	37,426	0	41,371	0	
25-Jun-09	29,675	0	32,413	0	

26-Jun-09	25,114	0	28,861	0	
27-Jun-09	30,643	0	32,732	0	
28-Jun-09	33,571	0	37,209	0	
29-Jun-09	27,832	0	36,009	0	
30-Jun-09	17,988	0	28,566	0	
JUN 2009	887,699	0	1,003,954	0	
1-Jul-09	34,453	0	36,595	0	Period (iii)
2-Jul-09	13,751	0	17,536	0	Period (iv)
3-Jul-09	24,796	0	25,348	0	
4-Jul-09	27,039	0	33,128	0	
5-Jul-09	21,959	0	24,151	0	
6-Jul-09	21,131	0	21,889	0	
7-Jul-09	14,163	0	14,397	0	
8-Jul-09	14,744	0	16,912	0	
9-Jul-09	18,766	0	19,730	0	
10-Jul-09	19,729	0	19,884	0	
11-Jul-09	24,666	0	25,073	0	
12-Jul-09	35,895	0	40,979	0	
13-Jul-09	33,971	0	38,416	0	
14-Jul-09	36,358	0	42,006	0	
15-Jul-09	37,542	0	41,304	0	
16-Jul-09	27,317	0	33,609	0	
17-Jul-09	35,532	0	40,338	0	
18-Jul-09	29,605	0	33,526	0	
19-Jul-09	29,372	0	36,352	0	
20-Jul-09	30,505	0	54,827	0	
21-Jul-09	33,578	0	37,672	0	
22-Jul-09	30,104	0	34,843	0	
23-Jul-09	38,149	0	44,366	0	
24-Jul-09	30,819	0	31,619	0	
25-Jul-09	34,045	0	37,561	0	
26-Jul-09	30,702	0	31,853	0	
27-Jul-09	31,058	0	33,550	0	
28-Jul-09	25,972	0	28,381	0	
29-Jul-09	27,059	0	30,077	0	
30-Jul-09	27,352	0	31,275	0	
31-Jul-09	37,645	0	38,880	0	
JUL 2009	877,777	0	996,077	0	
1-Aug-09	33,717	0	35,249	0	Period (iv)
2-Aug-09	19,268	0	19,875	0	
3-Aug-09	23,611	0	23,934	0	
4-Aug-09	25,412	0	25,942	0	
5-Aug-09	36,434	0	37,861	0	
6-Aug-09	35,175	0	36,447	0	
7-Aug-09	31,147	0	31,550	0	
8-Aug-09	30,517	0	37,497	0	
9-Aug-09	33,752	0	39,990	0	
10-Aug-09	33,338	0	34,528	0	
11-Aug-09	39,605	0	39,605	0	After 10 August 2009, the variation between the readings of "Total meter (GFM-008)" and the "Total of the four individual meters (GFM-003 and GFM-006)" stabilized, with the average total
12-Aug-09	35,402	0	35,402	0	
13-Aug-09	20,042	0	20,042	0	
14-Aug-09	18,116	0	18,116	0	
15-Aug-09	18,264	0	18,264	0	
16-Aug-09	18,809	0	18,809	0	
17-Aug-09	21,737	0	21,737	0	
18-Aug-09	29,084	0	29,084	0	
19-Aug-09	18,723	0	18,723	0	
20-Aug-09	28,104	0	28,104	0	

21-Aug-09	25,328	0	25,328	0	fluctuation between the individual and total meters being only 1.3%, well within the permissible error of the meters. Thus, the readings from individual meters (GFM-003 to GFM-006) are selected for CERs calculation, started from 11 August 2009.
22-Aug-09	25,807	0	25,807	0	
23-Aug-09	33,881	0	33,881	0	
24-Aug-09	31,225	0	31,225	0	
25-Aug-09	26,976	0	26,976	0	
26-Aug-09	30,365	0	30,365	0	
27-Aug-09	26,080	0	26,080	0	
28-Aug-09	30,204	0	30,204	0	
29-Aug-09	32,722	0	32,722	0	
30-Aug-09	29,085	0	29,085	0	
31-Aug-09	22,655	0	22,655	0	
AUG 2009	864,585	0	885,087	0	Ditto
1-Sep-09	25,743	0	25,743	0	
2-Sep-09	2,676	0	2,676	0	
3-Sep-09	10,692	0	10,692	0	
4-Sep-09	21,132	0	21,132	0	
5-Sep-09	15,245	0	15,245	0	
6-Sep-09	25,040	0	25,040	0	
7-Sep-09	29,245	0	29,245	0	
8-Sep-09	22,840	0	22,840	0	
9-Sep-09	16,788	0	16,788	0	
10-Sep-09	23,931	0	23,931	0	
11-Sep-09	33,674	0	33,674	0	
12-Sep-09	37,464	0	37,464	0	
13-Sep-09	26,943	0	26,943	0	
14-Sep-09	28,637	0	28,637	0	
15-Sep-09	35,934	0	35,934	0	
16-Sep-09	18,533	0	18,533	0	
17-Sep-09	29,807	0	29,807	0	
18-Sep-09	25,793	0	25,793	0	
19-Sep-09	21,202	0	21,202	0	
20-Sep-09	32,813	0	32,813	0	
21-Sep-09	18,752	0	18,752	0	
22-Sep-09	28,777	0	28,777	0	
23-Sep-09	16,350	0	16,350	0	
24-Sep-09	28,828	0	28,828	0	
25-Sep-09	28,168	0	28,168	0	
26-Sep-09	20,715	0	20,715	0	
27-Sep-09	19,699	0	19,699	0	
28-Sep-09	18,790	0	18,790	0	
29-Sep-09	22,391	0	22,391	0	
30-Sep-09	25,536	0	25,536	0	
SEP 2009	712,138	0	712,138	0	
1-Oct-09	25,729	0	25,729	0	
2-Oct-09	2,813	0	2,813	0	
3-Oct-09	13,069	0	13,069	0	
4-Oct-09	0	0	0	0	
5-Oct-09	11,333	0	11,333	0	
6-Oct-09	6,146	0	6,146	0	
7-Oct-09	11,245	0	11,245	0	
8-Oct-09	25,416	0	25,416	0	
9-Oct-09	22,278	0	22,278	0	
10-Oct-09	25,445	0	25,445	0	
11-Oct-09	26,416	0	26,416	0	
12-Oct-09	28,226	0	28,226	0	
13-Oct-09	23,959	0	23,959	0	
14-Oct-09	19,105	0	19,105	0	
15-Oct-09	25,461	0	25,461	0	

16-Oct-09	26,481	0	26,481	0	Ditto
17-Oct-09	34,104	0	34,104	0	
18-Oct-09	24,824	0	24,824	0	
19-Oct-09	25,560	0	25,560	0	
20-Oct-09	13,710	0	13,710	0	
21-Oct-09	22,556	0	22,556	0	
22-Oct-09	28,513	0	28,513	0	
23-Oct-09	32,477	0	32,477	0	
24-Oct-09	39,581	0	39,581	0	
25-Oct-09	31,403	0	31,403	0	
26-Oct-09	23,286	0	23,286	0	
27-Oct-09	17,952	0	17,952	0	
28-Oct-09	16,021	0	16,021	0	
29-Oct-09	24,311	0	24,311	0	
30-Oct-09	25,255	0	25,255	0	
31-Oct-09	30,890	0	30,890	0	
OCT 2009	683,565	0	683,565	0	
1-Nov-09	33,310	0	33,310	0	Ditto
2-Nov-09	24,822	0	24,822	0	
3-Nov-09	18,709	0	18,709	0	
4-Nov-09	27,068	0	27,068	0	
5-Nov-09	16,441	0	16,441	0	
6-Nov-09	17,725	0	17,725	0	
7-Nov-09	25,732	0	25,732	0	
8-Nov-09	25,528	0	25,528	0	
9-Nov-09	25,960	0	25,960	0	
10-Nov-09	22,616	0	22,616	0	
11-Nov-09	13,769	0	13,769	0	
12-Nov-09	16,648	0	16,648	0	
13-Nov-09	7,401	0	7,401	0	
14-Nov-09	24,882	0	24,882	0	
15-Nov-09	34,379	0	34,379	0	
16-Nov-09	27,236	0	27,236	0	
17-Nov-09	28,260	0	28,260	0	
18-Nov-09	16,445	0	16,445	0	
19-Nov-09	26,265	0	26,265	0	
20-Nov-09	21,364	0	21,364	0	
21-Nov-09	27,749	0	27,749	0	
22-Nov-09	33,066	0	33,066	0	
23-Nov-09	41,459	0	41,459	0	
24-Nov-09	30,221	0	30,221	0	
25-Nov-09	29,201	0	29,201	0	
26-Nov-09	29,648	0	29,648	0	
27-Nov-09	17,165	0	17,165	0	
28-Nov-09	37,378	0	37,378	0	
29-Nov-09	33,097	0	33,097	0	
30-Nov-09	29,780	0	29,780	0	
OCT 2009	763,324	0	763,324	0	

Monthly Aggregated

Date	Selected flows for BE calculation		Selected flows for PE calculation		Remark
	Selected total biogas fed to burners	Selected flow rate of biogas fed to flare	Selected total biogas fed to burners	Selected flow rate of biogas fed to flare	
	(Nm3/day)	(Nm3/day)	(Nm3/day)	(Nm3/day)	
APRIL 2009	0	0	0	0	
MAY 2009	376,240	692	384,731	713	
JUNE 2009	887,699	0	1,003,954	0	

JULY 2009	877,777	0	996,077	0
AUG 2009	864,585	0	885,087	0
SEP 2009	712,138	0	712,138	0
OCT 2009	683,565	0	683,565	0
NOV 2009	763,324	0	763,324	0
TOTAL	5,165,328	692	5,428,876	713

Referent source to I-DEV0319

<http://cdm.unfccc.int/Projects/deviations/04660>

Calculation of electricity consumption in the ancillary decanter facility as per

I-DEV0406 - Request for deviation for missing electricity meter, measuring the electricity consumption for the ancillary decanter facility

As per an approved deviation request I-DEV0406, the proposed alternative calculation is approved, where, electricity consumption for ancillary decanter facilities is calculated as
 Qelec in a month = [rated capacity of equipment (KW) x 24 (hrs/day) x (number of day in a month)] x [1.1 or 10% distribution losses]

Ancillary equipment installed at decanter facilities

No.	Equipment	Rated KW
1	Pump (pumping sludge from pond to clarifier)	30
2	Pump (pumping sludge from under flow clarifier pond to decanter)	4
3	Decanter motor	34
4	Adjust decanter speed	5.5
5	Belt conveyor	4
Total		77.5

Total number of operation hours per day taking into account

24 hours/day

Distribution losses

10%

Electricity consumption at ancillary decanter facility

Month	Number of day in a month (day/month)	Estimated electricity consumption ancillary decanter facility (KWh/month)
APR 2009	30	61,380
MAY 2009	31	63,426
JUN 2009	30	61,380
JUL 2009	31	63,426
AUG 2009	31	63,426
SEP 2009	30	61,380
OCT 2009	31	63,426
NOV 2009	30	61,380
TOTAL/AVERAGE	244	499,224

Referent source of I-DEV0406

<http://cdm.unfccc.int/Projects/deviations/16597>

Conversion of biogas flow from wet to dry basis (when biogas temperature is higher than 60 °C)

Regarding the statement mentioned in "Step 5" of the "Tool to determine project emissions from flaring gases containing methane, which stated that

"It is necessary to refer both measurements (flow rate of the residual gas and volumetric fraction of methane in the residual gas) to the same reference condition that may be dry or wet basis. If the residual gas moisture is significant (temperature greater than 60 °C), the measured flow rate of the residual gas that is usually referred to wet basis should be corrected to dry basis due to the fact that the measurement of methane is usually undertaken on a dry basis (i.e. water is removed before sample analysis)"

In SQS, the volumetric fraction of methane content in biogas was measured in dry basis, while, the biogas flow rate was measured in wet basis.

Thus, if the biogas temperature is greater than 60 °C, the conversion of biogas flow that was measured in wet to dry basis is required using the method in Option C provided in the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". This is the case for biogas flow measured in May 2009.

Notes:

- 1. Average temperature of biogas taken from a Total Meter (GFM-008) is approximately +30 C (which is < 60 C).
- 2. Average temperature of biogas taken from two sub-total meters (GFM-001 and GFM-002) is > 60 C. The reason that the temperature of biogas is increased was due to the flow meters are located at the position right after the biogas blowers
- Thus, the temperature of biogas at this position is increased due to the effect of pressure increased after the biogas is compressed by biogas blowers.
- 3. Average temperature of biogas taken from four individual meters is approximately +30 C (close to ambient temperature). The reason that the temperature of biogas is decreased, after reached the temperature above 60 C after the blowers, is due to the heat loss to the ambient along the biogas piping system between the biogas blowers and the biogas burners at the factories. The distance between biogas blowers and biogas burners at the factories is approximately of 500 meters, thus the temperature of biogas is getting closer to the ambient temperature.
- 4. In May 2009, amount of biogas flow to burners and flare was taken from the reading of two sub-total meters (GFM-001 and GFM-002) and the reading of flare meter (GFM-007), respectively. Thus, as the biogas temperature measured at these 3 meters are > 60 C, a conversion of biogas flow from wet to dry basis is required.

CALCULATION

Constant parameters used in calculation

No.	Parameters	Symbols	Units	Value	Remark
1	Atmosphere pressure	P_atm	Pascal (Pa)	101,325	
2	Molecular Mass of H2O	MM_H2O	kg/kmol	18	
3	Molecular Mass of CH4	MM_CH4	kg/kmol	16	
4	Molecular Mass of N2	MM_N2	kg/kmol	28	
5	Universal ideal gases constant	Ru	Pa.m3/kmol.K	8,314	
6	Constant pressure set as condition of biogas at burners & flare	P_biogas_burners	mBar	450	
7	Constant temperature set as condition of biogas at burners & flare	T_biogas_burners	C	30	
8	Reference perssure at Normal Condition	P_Normal	Pascal (Pa)	101,325	
9	Reference temperature at Normal Condition	T_Normal	C	0	
10	Global Warming Potential of CH4	GWP_CH4	tCO2e/tCH4	21	
11	Physical leakage from anaerobic digester	Physical laeage	fraction	0.15	

The conversion of biogas flow affected baseline emission calculation

B1-1: BE_Lagoon_Monitored

MONITORED PERIOD	BIOGAS VOLUME FLOWRATE		BIOGAS COMPOSITION			BIOGAS CONDITIONS					
	Biogas fed to burners	Biogas fed to flare	Composition of Dry Biogas		MM_Biogas kg / kmol	Condition of generated biogas					
						Abs. Pres.		Temp.	pH2O,Sat	[mH2O,db]	[vH2O,db]
			Nm3 (wet basis)	Nm3 (wet basis)		% CH4 (dry basis)	% N2	Pa.	C	Pa.	kgH2O/ kg dry gas
MAY 2009	376,240	692	49.5%	50.5%	22.1	141,065	64.3	24,296	0.1697	0.208	0.49

MONITORED PERIOD	OGAS VOLUME FLOWRATE (converted from Nm3 to m3_dry)		OGAS VOLUME FLOWRATE (converted from m3_wet to m3_dry)		OGAS VOLUME FLOWRATE (converted from m3_dry to Nm3_dry)	
	Biogas fed to burners	Biogas fed to flare	Biogas fed to burners	Biogas fed to flare	Biogas fed to burners	Biogas fed to flare
	m3 (wet basis)	m3 (wet basis)	m3 (dry basis)	m3 (dry basis)	Nm3 (dry basis)	Nm3 (dry basis)
MAY 2009	333,844	614	276,346	509	311,440	573

B1-2: BE_Lagoon_theoretical

PE_Phy_Leakage,m

MONITORED PERIOD	BIOGAS VOLUME FLOWRATE		BIOGAS COMPOSITION			BIOGAS CONDITIONS					
	Biogas fed to burners	Biogas fed to flare	Composition of Dry Biogas		MM_Biogas kg / kmol	Condition of generated biogas					
	Abs. Pres.	Temp.	pH2O,Sat	[mH2O,db]		[vH2O,db]	[wCH4]				
Pa.	C	Pa.	kgH2O/ kg dry gas	m3H2O/ m3 dry gas	m3 CH4/ m3 dry biogas						
MAY 2009	384,731	713	49.5%	50.5%	22.1	141,065	64.3	24,296	0.0000	0.000	0.49

MONITORED PERIOD	OGAS VOLUME FLOWRATE (converted from Nm3 to m3_dry)		OGAS VOLUME FLOWRATE (converted from m3_wet to m3_dry)		OGAS VOLUME FLOWRATE (converted from m3_dry to Nm3_dry)	
	Biogas fed to burners	Biogas fed to flare	Biogas fed to burners	Biogas fed to flare	Biogas fed to burners	Biogas fed to flare
	m3 (wet basis)	m3 (wet basis)	m3 (dry)	m3 (dry)	Nm3 (dry basis)	Nm3 (dry basis)
MAY 2009	341,378	633	341,378	633	384,731	713

MONITORED PERIOD	BIOGAS VOLUME FLOWRATE		BIOGAS COMPOSITION			BIOGAS CONDITIONS					
	Biogas fed to burners	Biogas fed to flare	Composition of Dry Biogas		MM_Biogas kg / kmol	Condition of generated biogas					
						Abs. Pres.		Temp.	pH2O,Sat	[mH2O,db]	[vH2O,db]
			Nm3 (wet basis)	Nm3 (wet basis)		% CH4	% N	Pa.	C	Pa.	kgH2O/ kg dry gas
MAY 2009	384,731	713	49.5%	50.5%	22.1	141,065	64.3	24,296	0.000	0.000	0.49

MONITORED PERIOD	BIOGAS VOLUME FLOW RATE (converted from Nm3 to m3)		OGAS VOLUME FLOWRATE (converted from m3_wet to m3_dry)		OGAS VOLUME FLOWRATE (converted from m3_dry to Nm3_dry)	
	Biogas fed to burners	Biogas fed to flare	Biogas fed to burners	Biogas fed to flare	Biogas fed to burners	Biogas fed to flare
MAY 2009	341,378	633	341,378	633	384,731	713

Corrections of monitored values used for CERs calculation using instruction provided under EB52 ANNEX60 - Guidelines for assessing compliance with the calibration frequency requirements

The monitored values of the following parameters and equipments are required a correction regarding to EB52 ANNEX60

No	Parameters	Symbols	Monitoring Equipments	Equipment ID	Maximum Permissible Error of Equipments (± %)
1	Biogas flow to factory 2	$Q_{\text{biogas_total}}$	Biogas Flow Meter	GFM-002	1.50%
2	Biogas flow to flare	$Q_{\text{biogas_flare}}$	Biogas Flow Meter	GFM-007	1.50%
3	Electricity consumed in project activity	$Q_{\text{elect_cons}}$	Electricity Meter	WM-01	2.00%

No	Period needs correction (inclusive)		Date of next calibration report available	Error found in next	Correction factor (as per EB52 ANNEX60)	
	Start	Stop			For BE calculation	For PE calculation
1	15-Apr-09	1-Jul-09	12-Dec-09	0.01%	-1.50%	1.50%
2	15-Apr-09	8-Nov-09	9-Nov-09	0.14%	-1.50%	1.50%
3	15-Apr-09	30-Nov-09	15-Mar-09	0.31%	Not relevant	2.00%

1. Correction of monitored values of biogas flow to factory 2 (GFM-002)

Date	Actual values monitored by GFM-002 (Nm ³ /day)	Adjusted values for BE calculation (Nm ³ /day)	Adjusted values for PE calculation (Nm ³ /day)
15-Apr-09	0	0	0
16-Apr-09	0	0	0
17-Apr-09	0	0	0
18-Apr-09	0	0	0
19-Apr-09	0	0	0
20-Apr-09	0	0	0
21-Apr-09	0	0	0
22-Apr-09	0	0	0
23-Apr-09	0	0	0
24-Apr-09	0	0	0
25-Apr-09	0	0	0
26-Apr-09	0	0	0
27-Apr-09	0	0	0
28-Apr-09	0	0	0
29-Apr-09	0	0	0
30-Apr-09	0	0	0
APR 2009	0	0	0
1-May-09	0	0	0
2-May-09	0	0	0
3-May-09	0	0	0
4-May-09	0	0	0
5-May-09	0	0	0
6-May-09	0	0	0
7-May-09	0	0	0
8-May-09	0	0	0
9-May-09	0	0	0
10-May-09	0	0	0
11-May-09	0	0	0
12-May-09	0	0	0
13-May-09	11,755	11,578	11,931
14-May-09	8,948	8,814	9,082
15-May-09	14,031	13,820	14,241
16-May-09	13,509	13,306	13,711
17-May-09	5,862	5,774	5,949
18-May-09	10,396	10,240	10,552
19-May-09	8,162	8,040	8,284
20-May-09	16,512	16,264	16,759
21-May-09	13,149	12,952	13,346
22-May-09	18,649	18,369	18,929
23-May-09	14,904	14,681	15,128
24-May-09	18,726	18,445	19,006
25-May-09	15,207	14,979	15,435
26-May-09	16,457	16,210	16,704
27-May-09	20,936	20,621	21,250
28-May-09	17,676	17,411	17,941
29-May-09	19,968	19,668	20,268
30-May-09	17,032	16,777	17,287
31-May-09	21,157	20,840	21,474
MAY 2009	283,033	278,788	287,279
1-Jun-09	18,819	18,536	19,101
2-Jun-09	17,137	16,879	17,394
3-Jun-09	20,204	19,900	20,507
4-Jun-09	17,404	17,143	17,665
5-Jun-09	22,870	22,527	23,213
6-Jun-09	22,965	22,620	23,309
7-Jun-09	23,352	23,002	23,703
8-Jun-09	23,400	23,049	23,751
9-Jun-09	16,937	16,683	17,191
10-Jun-09	20,039	19,738	20,339
11-Jun-09	19,170	18,882	19,457
12-Jun-09	17,369	17,108	17,630
13-Jun-09	18,378	18,102	18,653
14-Jun-09	23,014	22,668	23,359
15-Jun-09	20,290	19,986	20,594
16-Jun-09	22,150	21,817	22,482

17-Jun-09	24,276	23,911	24,640	
18-Jun-09	20,874	20,561	21,187	
19-Jun-09	23,695	23,339	24,050	
20-Jun-09	21,430	21,109	21,752	
21-Jun-09	22,905	22,561	23,248	
22-Jun-09	16,902	16,648	17,155	
23-Jun-09	24,725	24,354	25,096	
24-Jun-09	21,333	21,013	21,652	
25-Jun-09	19,514	19,221	19,807	
26-Jun-09	16,855	16,602	17,107	
27-Jun-09	20,087	19,785	20,388	
28-Jun-09	21,502	21,179	21,824	
29-Jun-09	17,829	17,561	18,096	
30-Jun-09	18,477	18,200	18,754	
JUN 2009	613,894	604,686	623,102	
1-Jul-09	21,586	21,262	21,909	End of correction period

2. Correction of monitored values of biogas flow to flare (GFM-007)

Date	Actual values monitored by GFM-007 (Nm ³ /day)	Adjusted values for BE calculation (Nm ³ /day)	Adjusted values for PE calculation (Nm ³ /day)
15-Apr-09	0	0	0
16-Apr-09	0	0	0
17-Apr-09	0	0	0
18-Apr-09	0	0	0
19-Apr-09	0	0	0
20-Apr-09	0	0	0
21-Apr-09	0	0	0
22-Apr-09	0	0	0
23-Apr-09	0	0	0
24-Apr-09	0	0	0
25-Apr-09	0	0	0
26-Apr-09	0	0	0
27-Apr-09	0	0	0
28-Apr-09	0	0	0
29-Apr-09	0	0	0
30-Apr-09	0	0	0
APR 2009	0	0	0
1-May-09	0	0	0
2-May-09	0	0	0
3-May-09	0	0	0
4-May-09	0	0	0
5-May-09	0	0	0
6-May-09	0	0	0
7-May-09	0	0	0
8-May-09	0	0	0
9-May-09	0	0	0
10-May-09	0	0	0
11-May-09	0	0	0
12-May-09	255	251	259
13-May-09	448	441	454
14-May-09	0	0	0
15-May-09	0	0	0
16-May-09	0	0	0
17-May-09	0	0	0
18-May-09	0	0	0
19-May-09	0	0	0
20-May-09	0	0	0
21-May-09	0	0	0
22-May-09	0	0	0
23-May-09	0	0	0
24-May-09	0	0	0
25-May-09	0	0	0
26-May-09	0	0	0
27-May-09	0	0	0
28-May-09	0	0	0
29-May-09	0	0	0
30-May-09	0	0	0
31-May-09	0	0	0
MAY 2009	703	692	713
1-Jun-09	0	0	0
2-Jun-09	0	0	0
3-Jun-09	0	0	0
4-Jun-09	0	0	0
5-Jun-09	0	0	0
6-Jun-09	0	0	0
7-Jun-09	0	0	0
8-Jun-09	0	0	0
9-Jun-09	0	0	0
10-Jun-09	0	0	0
11-Jun-09	0	0	0
12-Jun-09	0	0	0
13-Jun-09	0	0	0
14-Jun-09	0	0	0
15-Jun-09	0	0	0
16-Jun-09	0	0	0

17-Jun-09	0	0	0
18-Jun-09	0	0	0
19-Jun-09	0	0	0
20-Jun-09	0	0	0
21-Jun-09	0	0	0
22-Jun-09	0	0	0
23-Jun-09	0	0	0
24-Jun-09	0	0	0
25-Jun-09	0	0	0
26-Jun-09	0	0	0
27-Jun-09	0	0	0
28-Jun-09	0	0	0
29-Jun-09	0	0	0
30-Jun-09	0	0	0
JUN 2009	0	0	0
1-Jul-09	0	0	0
2-Jul-09	0	0	0
3-Jul-09	0	0	0
4-Jul-09	0	0	0
5-Jul-09	0	0	0
6-Jul-09	0	0	0
7-Jul-09	0	0	0
8-Jul-09	0	0	0
9-Jul-09	0	0	0
10-Jul-09	0	0	0
11-Jul-09	0	0	0
12-Jul-09	0	0	0
13-Jul-09	0	0	0
14-Jul-09	0	0	0
15-Jul-09	0	0	0
16-Jul-09	0	0	0
17-Jul-09	0	0	0
18-Jul-09	0	0	0
19-Jul-09	0	0	0
20-Jul-09	0	0	0
21-Jul-09	0	0	0
22-Jul-09	0	0	0
23-Jul-09	0	0	0
24-Jul-09	0	0	0
25-Jul-09	0	0	0
26-Jul-09	0	0	0
27-Jul-09	0	0	0
28-Jul-09	0	0	0
29-Jul-09	0	0	0
30-Jul-09	0	0	0
31-Jul-09	0	0	0
JUL 2009	0	0	0
1-Aug-09	0	0	0
2-Aug-09	0	0	0
3-Aug-09	0	0	0
4-Aug-09	0	0	0
5-Aug-09	0	0	0
6-Aug-09	0	0	0
7-Aug-09	0	0	0
8-Aug-09	0	0	0
9-Aug-09	0	0	0
10-Aug-09	0	0	0
11-Aug-09	0	0	0
12-Aug-09	0	0	0
13-Aug-09	0	0	0
14-Aug-09	0	0	0
15-Aug-09	0	0	0
16-Aug-09	0	0	0
17-Aug-09	0	0	0
18-Aug-09	0	0	0
19-Aug-09	0	0	0
20-Aug-09	0	0	0
21-Aug-09	0	0	0
22-Aug-09	0	0	0
23-Aug-09	0	0	0
24-Aug-09	0	0	0
25-Aug-09	0	0	0
26-Aug-09	0	0	0
27-Aug-09	0	0	0
28-Aug-09	0	0	0
29-Aug-09	0	0	0
30-Aug-09	0	0	0
31-Aug-09	0	0	0
AUG 2009	0	0	0
1-Sep-09	0	0	0
2-Sep-09	0	0	0
3-Sep-09	0	0	0
4-Sep-09	0	0	0
5-Sep-09	0	0	0
6-Sep-09	0	0	0
7-Sep-09	0	0	0
8-Sep-09	0	0	0

9-Sep-09	0	0	0
10-Sep-09	0	0	0
11-Sep-09	0	0	0
12-Sep-09	0	0	0
13-Sep-09	0	0	0
14-Sep-09	0	0	0
15-Sep-09	0	0	0
16-Sep-09	0	0	0
17-Sep-09	0	0	0
18-Sep-09	0	0	0
19-Sep-09	0	0	0
20-Sep-09	0	0	0
21-Sep-09	0	0	0
22-Sep-09	0	0	0
23-Sep-09	0	0	0
24-Sep-09	0	0	0
25-Sep-09	0	0	0
26-Sep-09	0	0	0
27-Sep-09	0	0	0
28-Sep-09	0	0	0
29-Sep-09	0	0	0
30-Sep-09	0	0	0
SEP 2009	0	0	0
1-Oct-09	0	0	0
2-Oct-09	0	0	0
3-Oct-09	0	0	0
4-Oct-09	0	0	0
5-Oct-09	0	0	0
6-Oct-09	0	0	0
7-Oct-09	0	0	0
8-Oct-09	0	0	0
9-Oct-09	0	0	0
10-Oct-09	0	0	0
11-Oct-09	0	0	0
12-Oct-09	0	0	0
13-Oct-09	0	0	0
14-Oct-09	0	0	0
15-Oct-09	0	0	0
16-Oct-09	0	0	0
17-Oct-09	0	0	0
18-Oct-09	0	0	0
19-Oct-09	0	0	0
20-Oct-09	0	0	0
21-Oct-09	0	0	0
22-Oct-09	0	0	0
23-Oct-09	0	0	0
24-Oct-09	0	0	0
25-Oct-09	0	0	0
26-Oct-09	0	0	0
27-Oct-09	0	0	0
28-Oct-09	0	0	0
29-Oct-09	0	0	0
30-Oct-09	0	0	0
31-Oct-09	0	0	0
OCT 2009	0	0	0
1-Nov-09	0	0	0
2-Nov-09	0	0	0
3-Nov-09	0	0	0
4-Nov-09	0	0	0
5-Nov-09	0	0	0
6-Nov-09	0	0	0
7-Nov-09	0	0	0
8-Nov-09	0	0	0

3. Correction of monitored values of electricity consumed in project activity (WM-01)

Date	Actual values monitored by WM-01 (kWh/day)	Not relevant to BE calculation	Adjusted values for PE calculation (kWh/day)
15-Apr-09	32		33
16-Apr-09	64		65
17-Apr-09	96		98
18-Apr-09	64		65
19-Apr-09	32		33
20-Apr-09	64		65
21-Apr-09	96		98
22-Apr-09	64		65
23-Apr-09	96		98
24-Apr-09	96		98
25-Apr-09	64		65
26-Apr-09	64		65
27-Apr-09	96		98
28-Apr-09	32		33
29-Apr-09	64		65
30-Apr-09	32		33
APR 2009	1,056		1,077

1-May-09	64	65
2-May-09	32	33
3-May-09	96	98
4-May-09	96	98
5-May-09	64	65
6-May-09	64	65
7-May-09	64	65
8-May-09	64	65
9-May-09	96	98
10-May-09	64	65
11-May-09	480	490
12-May-09	992	1,012
13-May-09	1,344	1,371
14-May-09	960	979
15-May-09	1,312	1,338
16-May-09	1,248	1,273
17-May-09	896	914
18-May-09	1,408	1,436
19-May-09	1,248	1,273
20-May-09	1,472	1,501
21-May-09	1,216	1,240
22-May-09	1,536	1,567
23-May-09	1,440	1,469
24-May-09	1,568	1,599
25-May-09	1,968	2,007
26-May-09	2,288	2,334
27-May-09	2,240	2,285
28-May-09	1,872	1,909
29-May-09	1,776	1,812
30-May-09	2,432	2,481
31-May-09	2,080	2,122
MAY 2009	32,480	33,130
1-Jun-09	1,920	1,958
2-Jun-09	1,760	1,795
3-Jun-09	2,912	2,970
4-Jun-09	2,432	2,481
5-Jun-09	2,720	2,774
6-Jun-09	2,592	2,644
7-Jun-09	2,448	2,497
8-Jun-09	2,832	2,889
9-Jun-09	2,240	2,285
10-Jun-09	2,442	2,490
11-Jun-09	2,358	2,406
12-Jun-09	2,496	2,546
13-Jun-09	2,304	2,350
14-Jun-09	2,272	2,317
15-Jun-09	2,304	2,350
16-Jun-09	2,432	2,481
17-Jun-09	2,272	2,317
18-Jun-09	2,176	2,220
19-Jun-09	2,080	2,122
20-Jun-09	2,368	2,415
21-Jun-09	2,064	2,105
22-Jun-09	1,872	1,909
23-Jun-09	2,480	2,530
24-Jun-09	2,096	2,138
25-Jun-09	1,936	1,975
26-Jun-09	1,408	1,436
27-Jun-09	1,808	1,844
28-Jun-09	1,984	2,024
29-Jun-09	2,368	2,415
30-Jun-09	1,920	1,958
JUN 2009	67,296	68,642
1-Jul-09	2,656	2,709
2-Jul-09	2,016	2,056
3-Jul-09	2,528	2,579
4-Jul-09	2,592	2,644
5-Jul-09	2,368	2,415
6-Jul-09	2,195	2,239
7-Jul-09	1,837	1,874
8-Jul-09	2,256	2,301
9-Jul-09	1,910	1,949
10-Jul-09	1,834	1,870
11-Jul-09	2,384	2,432
12-Jul-09	2,560	2,611
13-Jul-09	2,336	2,383
14-Jul-09	2,368	2,415
15-Jul-09	2,400	2,448
16-Jul-09	1,888	1,926
17-Jul-09	2,080	2,122
18-Jul-09	1,280	1,306
19-Jul-09	2,752	2,807
20-Jul-09	1,952	1,991
21-Jul-09	2,624	2,676
22-Jul-09	2,720	2,774
23-Jul-09	3,040	3,101
24-Jul-09	2,576	2,628

25-Jul-09	2,512	2,562
26-Jul-09	2,400	2,448
27-Jul-09	1,920	1,958
28-Jul-09	1,696	1,730
29-Jul-09	1,664	1,697
30-Jul-09	2,416	2,464
31-Jul-09	2,096	2,138
JUL 2009	69,856	71,253
1-Aug-09	1,904	1,942
2-Aug-09	1,392	1,420
3-Aug-09	2,304	2,350
4-Aug-09	2,464	2,513
5-Aug-09	2,768	2,823
6-Aug-09	1,744	1,779
7-Aug-09	2,048	2,089
8-Aug-09	1,920	1,958
9-Aug-09	2,080	2,122
10-Aug-09	2,048	2,089
11-Aug-09	2,144	2,187
12-Aug-09	2,112	2,154
13-Aug-09	1,376	1,404
14-Aug-09	1,248	1,273
15-Aug-09	1,536	1,567
16-Aug-09	1,280	1,306
17-Aug-09	2,368	2,415
18-Aug-09	2,368	2,415
19-Aug-09	1,600	1,632
20-Aug-09	2,400	2,448
21-Aug-09	2,176	2,220
22-Aug-09	2,288	2,334
23-Aug-09	1,776	1,812
24-Aug-09	1,696	1,730
25-Aug-09	1,312	1,338
26-Aug-09	1,344	1,371
27-Aug-09	1,472	1,501
28-Aug-09	1,552	1,583
29-Aug-09	1,552	1,583
30-Aug-09	1,504	1,534
31-Aug-09	1,376	1,404
AUG 2009	57,152	58,295
1-Sep-09	1,472	1,501
2-Sep-09	256	261
3-Sep-09	1,696	1,730
4-Sep-09	2,464	2,513
5-Sep-09	1,760	1,795
6-Sep-09	1,472	1,501
7-Sep-09	2,240	2,285
8-Sep-09	2,112	2,154
9-Sep-09	1,952	1,991
10-Sep-09	1,440	1,469
11-Sep-09	2,208	2,252
12-Sep-09	2,384	2,432
13-Sep-09	1,616	1,648
14-Sep-09	1,472	1,501
15-Sep-09	1,536	1,567
16-Sep-09	1,152	1,175
17-Sep-09	1,472	1,501
18-Sep-09	1,440	1,469
19-Sep-09	1,248	1,273
20-Sep-09	1,440	1,469
21-Sep-09	1,248	1,273
22-Sep-09	1,408	1,436
23-Sep-09	1,312	1,338
24-Sep-09	2,048	2,089
25-Sep-09	1,904	1,942
26-Sep-09	2,032	2,073
27-Sep-09	2,096	2,138
28-Sep-09	2,000	2,040
29-Sep-09	2,096	2,138
30-Sep-09	1,942	1,981
SEP 2009	50,918	51,937
1-Oct-09	1,066	1,087
2-Oct-09	560	571
3-Oct-09	848	865
4-Oct-09	368	375
5-Oct-09	1,632	1,665
6-Oct-09	1,504	1,534
7-Oct-09	1,184	1,208
8-Oct-09	2,208	2,252
9-Oct-09	2,240	2,285
10-Oct-09	2,336	2,383
11-Oct-09	1,840	1,877
12-Oct-09	1,296	1,322
13-Oct-09	1,264	1,289
14-Oct-09	1,104	1,126
15-Oct-09	1,280	1,306
16-Oct-09	1,376	1,404

17-Oct-09	1,568	1,599
18-Oct-09	1,312	1,338
19-Oct-09	1,408	1,436
20-Oct-09	1,696	1,730
21-Oct-09	2,112	2,154
22-Oct-09	2,016	2,056
23-Oct-09	2,240	2,285
24-Oct-09	1,632	1,665
25-Oct-09	1,360	1,387
26-Oct-09	1,104	1,126
27-Oct-09	1,120	1,142
28-Oct-09	928	947
29-Oct-09	1,344	1,371
30-Oct-09	960	979
31-Oct-09	1,280	1,306
OCT 2009	44,186	45,069
1-Nov-09	1,264	1,289
2-Nov-09	1,168	1,191
3-Nov-09	1,248	1,273
4-Nov-09	1,376	1,404
5-Nov-09	1,024	1,044
6-Nov-09	1,216	1,240
7-Nov-09	1,440	1,469
8-Nov-09	1,376	1,404
9-Nov-09	2,112	2,154
10-Nov-09	2,464	2,513
11-Nov-09	2,016	2,056
12-Nov-09	1,280	1,306
13-Nov-09	1,328	1,355
14-Nov-09	2,288	2,334
15-Nov-09	2,480	2,530
16-Nov-09	2,224	2,268
17-Nov-09	1,568	1,599
18-Nov-09	928	947
19-Nov-09	1,280	1,306
20-Nov-09	1,184	1,208
21-Nov-09	1,408	1,436
22-Nov-09	1,408	1,436
23-Nov-09	1,568	1,599
24-Nov-09	1,536	1,567
25-Nov-09	1,376	1,404
26-Nov-09	1,472	1,501
27-Nov-09	1,088	1,110
28-Nov-09	1,520	1,550
29-Nov-09	1,008	1,028
30-Nov-09	1,856	1,893
NOV 2009	45,504	46,414

Comparison of ambient temperature moniotred on-site Vs. ambient temperature obtained from Thai Methero logical Department (hereafter referred to as "TMD") at Chaiyaphumi province where project site is located

Monitoring Equipment installed on site : Mercury Thermometer

Equipment ID used in monitoring report: TIC-001

Comparision results

Months	Monthly avearge ambient temperature (°C)		Different in ± °C
	Monitored Data obtained from TIC-001 on-site	Data obtained from TMD	
APRIL 2009			
MAY 2009	25.9	28.1	2.24
JUNE 2009	27.8	28.4	0.56
JULY 2009	27.2	27.9	0.67
AUG 2009	27.3	28.1	0.79
SEP 2009	26.5	27.5	1.01
OCT 2009	27.1	27.8	0.74
NOV 2009	25.9	25.7	-0.20
Average	26.8	27.6	0.83

Note: The comparison results show that the differences are not significant. The lower of monitored values that applied for ERs calculation are conservative, as the ERs will be higher at higher ambient temperature

Data obtained from TMD's officer (Mr. Somkuan via e-mail info_service@tmd.go.th)

stn_name	stncode	year	month	extrmax	extrmin	meantemp
๑haiyaphum*๑	403201	2006	1	36.4	15.3	24.8
๑haiyaphum*๑	403201	2006	2	37.4	19.6	27.0
๑haiyaphum*๑	403201	2006	3	39.3	18.8	28.9
๑haiyaphum*๑	403201	2006	4	38.5	22.5	29.3
๑haiyaphum*๑	403201	2006	5	38	22.7	28.5
๑haiyaphum*๑	403201	2006	6	37.1	23.9	28.9
๑haiyaphum*๑	403201	2006	7	35.3	23	27.8
๑haiyaphum*๑	403201	2006	8	35	21.4	27.4
๑haiyaphum*๑	403201	2006	9	35.6	23	27.4
๑haiyaphum*๑	403201	2006	10	33.6	22.4	27.5
๑haiyaphum*๑	403201	2006	11	35.8	16.7	27.4
๑haiyaphum*๑	403201	2006	12	34.5	12.5	24.4
๑haiyaphum*๑	403201	2007	1	34.2	15.5	24.3
๑haiyaphum*๑	403201	2007	2	38.4	12.2	27.1
๑haiyaphum*๑	403201	2007	3	38.6	21	29.7
๑haiyaphum*๑	403201	2007	4	40.9	23.1	29.8
๑haiyaphum*๑	403201	2007	5	37.2	23.6	28.1
๑haiyaphum*๑	403201	2007	6	36.6	23	29.2
๑haiyaphum*๑	403201	2007	7	36.2	23.5	28.5
๑haiyaphum*๑	403201	2007	8	36.1	22.4	27.7
๑haiyaphum*๑	403201	2007	9	35.2	22.6	27.5
๑haiyaphum*๑	403201	2007	10	32.4	21.6	26.6
๑haiyaphum*๑	403201	2007	11	31.8	14.7	24.3

๑haiyaphum*๑	403201	2007	12	34.5	16.2	25.6
๑haiyaphum*๑	403201	2008	1	35.5	13.1	24.4
๑haiyaphum*๑	403201	2008	2	36	16.6	24
๑haiyaphum*๑	403201	2008	3	38.1	18.2	28.2
๑haiyaphum*๑	403201	2008	4	37	21.7	28.9
๑haiyaphum*๑	403201	2008	5	35.2	22	27.8
๑haiyaphum*๑	403201	2008	6	34.7	22.9	28.1
๑haiyaphum*๑	403201	2008	7	34.1	22.8	27.9
๑haiyaphum*๑	403201	2008	8	34.6	21.9	27.4
๑haiyaphum*๑	403201	2008	9	33.9	22	26.8
๑haiyaphum*๑	403201	2008	10	34	23	27.4
๑haiyaphum*๑	403201	2008	11	33.5	16.6	25.1
๑haiyaphum*๑	403201	2008	12	30.7	15.2	23.1
๑haiyaphum*๑	403201	2009	1	33.9	12.2	22.4
๑haiyaphum*๑	403201	2009	2	39.2	17.7	28
๑haiyaphum*๑	403201	2009	3	38.5	18.6	28.4
๑haiyaphum*๑	403201	2009	4	39.2	22.7	29.4
๑haiyaphum*๑	403201	2009	5	37.1	23	28.1
๑haiyaphum*๑	403201	2009	6	35.3	23.2	28.4
๑haiyaphum*๑	403201	2009	7	36.3	23	27.9
๑haiyaphum*๑	403201	2009	8	35.2	22.6	28.1
๑haiyaphum*๑	403201	2009	9	35.2	23.4	27.5
๑haiyaphum*๑	403201	2009	10	33.7	22.7	27.8
๑haiyaphum*๑	403201	2009	11	36	15.7	25.7
๑haiyaphum*๑	403201	2009	12	34.4	16.8	24.9

1st monitoring period

Calculation of empirical factor stack gas to biogas feed rate ratio (Nm3 stack gas/Nin3 biogas feed) - as per an approved revision of monitoring plan on Q_{burner stack}

[illegible]

Calculation of combustion efficiency of biogas burners - For August to October 2009

Parameters	Unit	Factory 1	Factory 1	Factory 2	Factory 2	Remark
		Burner -01 (GFM-003)	Burner -02 (GFM-004)	Burner -01 (GFM-005)	Burner -01 (GFM-006)	
testing day	day	22-Oct-09	22-Oct-09	22-Oct-09	22-Oct-09	
Calculation of amount of CH4 fed to burner (kg CH4 fe to burner)----(1)						
Biogas fed to burner (dry basis), normal condition	Nm3/hr	450	425	515	545	Test result from measurement campaign
CH4 content in biogas (dry basis)	m3 CH3/m3 dry biogas	0.46	0.46	0.47	0.47	Test result from measurement campaign
Density of CH4 at normal condition	kg CH4/Nm3 CH4	0.716	0.716	0.716	0.716	Standard CH4 density at normal condition as per the "tool to determine project emission from flaring gases containing methane"
Mass flow rate of CH4 fed to burner	kg CH4/hr	148	139	174	184	
Meaurement campaign result of stack gas flow rate						
Therefore, empirical factor of stack gas to biogas feed rate ratio applied in this monitoring	Nm ³ -stack_gas/Nm ³ -biogas	40.0	Calculated as per the shhet entitled as "Factor of stack gas flow rate"			
Measurement campaign result of fraction of methane content in stack gas						
Methane concentration in stack gas (at T = 25 C, P = 1 atm)	ppm	63.5	58.2	28.1	14.5	
	kg-CH4/m ³ -stack gas	4.16E-05	3.81E-05	1.84E-05	9.49E-06	http://www.epa.gov/ttnatw01/hlthef/benzene.html
Density of CH4 at T = 25 C and P = 1 atm)	kg-CH4/Nm ³ -CH4	0.65	0.65	0.65	0.65	Tool to determine the mass flow of a greenhouse gas in a gaseous stream
	Nm ³ -CH4/Nm ³ Stack gas	6.35E-05	5.82E-05	2.81E-05	1.45E-05	
Calculation of CH4 in stack burners (kg CH4 in stack burner)----(2)						
Calculated stack gas flow rate	N-m ³ /hr	18,000	17,000	20,600	21,800	
Concentration of methane in stack gas	kg-CH4/m ³ -stack gas	4.16E-05	3.81E-05	1.84E-05	9.49E-06	Test result from measurement campaign
	kg CH4/hr	0.748	0.647	0.379	0.207	
The combustion efficiency of burner	fraction	0.995	0.995	0.998	0.999	
Biogas fed to burners during August to October 2009	Nm3	487,157	396,473	348,355	1,037,952	
Weighted average combustion efficiency of burners	fraction	0.9973				

Calculation of combustion efficiency of biogas burners - For November 2009

Parameters	Unit	Factory 1	Factory 1	Factory 2	Factory 2	Remark
		Burner -01 (GFM-003)	Burner -02 (GFM-004)	Burner -01 (GFM-	Burner -01 (GFM-006)	
testing day	day	13-Dec-09	13-Dec-09	13-Dec-09	13-Dec-09	

Calculation of amount of CH4 fed to burner (kg CH4 fe to burner)----(1)						
Biogas fed to burner (dry basis), normal condition	Nm3/hr	425	422	680	570	Test result from measurement campaign
CH4 content in biogas (dry basis)	m3 CH3/m3 dry biogas	0.55	0.57	0.56	0.57	Test result from measurement campaign
Density of CH4 at normal condition	kg CH4/Nm3 CH4	0.716	0.716	0.716	0.716	Standard CH4 density at normal condition as per the "tool to determine project emission from flaring gases containing methane"
Mass flow rate of CH4 fed to burner	kg CH4/hr	169	173	274	233	

Meaurement campaign result of stack gas flow rate					
Therefore, empirical factor of stack gas to biogas feed rate ratio applied in this monitoring	$\text{Nm}^3\text{-stack_gas}/\text{Nm}^3\text{-biogas}$	40.0	Calculated as per the shhet entitled as "Factor of stack gas flow rate"		
Measurement campaign result of fraction of methane content in stack gas					
Methane concentration in stack gas (at T = 25 C, P = 1 atm)	ppm	16.65	8.40	20.58	15.21
	kg-CH4/m3-stack gas	1.09E-05	5.50E-06	1.35E-05	9.95E-06
Density of CH4 at T = 25 C and P = 1 atm)	kg-CH4/Nm ³ -CH4	0.65	0.65	0.65	0.65
	Nm ³ -CH4/Nm ³ -Stack gas	1.67E-05	8.40E-06	2.06E-05	1.52E-05

Calculation of CH4 in stack burners (kg CH4 in stack burner)---(2)						
Calculated stack gas flow rate	N-m ³ /hr	17,000	16,880	27,200	22,800	
Concentration of methane in stack gas	kg-CH4/m ³ -stack gas	1.09E-05	5.50E-06	1.35E-05	9.95E-06	Test result from measurement campaign
	kg CH4/hr	0.185	0.093	0.366	0.227	
The combustion efficiency of burner	fraction	0.999	0.999	0.999	0.999	
Biogas fed to burners during November 2009	Nm3	130,074	112,521	113,916	406,813	
Weighted average combustion efficiency of burners	fraction	0.999				

Thermodynamics table - use to calculate saturated pressure of H2O at a given biogas temperature

Saturated Water (H2O)--Temperature Table									
		Spec. Volume		Internal Energy		Enthalpy		Entropy	
deg-C	kPa	m ³ /kg		kJ/kg		kJ/kg		kJ/kg*K	
Temp.	Sat. press.	Sat. Liquid	Sat. vapor	Sat. Liquid	Sat. vapor	Sat. Liquid	Sat. vapor	Sat. Liquid	Sat. vapor
T 0C	p_sat@T	vf	vg	uf	ug	hf	hg	sf	sg
0.0	0.61130	0.001000	206.14	0.00	2375.3	0.01	2501.4	0.0000	9.1562
5	0.8721	0.001000	147.12	20.97	2382.3	20.98	2510.6	0.0761	9.0257
10	1.2276	0.001000	106.38	42.00	2389.2	42.01	2519.8	0.1510	8.9008
15	1.7051	0.001001	77.93	62.99	2396.1	62.99	2528.9	0.2245	8.7814
20	2.339	0.001002	57.79	83.95	2402.9	83.96	2538.1	0.2966	8.6672
25	3.169	0.001003	43.36	104.88	2409.8	104.89	2547.2	0.3674	8.5580
30	4.246	0.001004	32.89	125.78	2416.6	125.79	2556.3	0.4369	8.4533
35	5.628	0.001006	25.22	146.67	2423.4	146.68	2565.3	0.5053	8.3531
40	7.384	0.001008	19.52	167.56	2430.1	167.57	2574.3	0.5725	8.2570
45	9.593	0.001010	15.26	188.44	2436.8	188.45	2583.2	0.6387	8.1648
50	12.349	0.001012	12.03	209.32	2443.5	209.33	2592.1	0.7038	8.0763
55	15.758	0.001015	9.568	230.21	2450.1	230.23	2600.9	0.7679	7.9913
60	19.940	0.001017	7.671	251.11	2456.6	251.13	2609.6	0.8312	7.9096
65	25.03	0.001020	6.197	272.02	2463.1	272.06	2618.3	0.8935	7.8310
70	31.19	0.001023	5.042	292.95	2469.6	292.98	2626.8	0.9549	7.7553
75	38.58	0.001026	4.131	313.90	2475.9	313.93	2643.7	1.0155	7.6824
80	47.39	0.001029	3.407	334.86	2482.2	334.91	2635.3	1.0753	7.6122
85	57.83	0.001033	2.828	355.84	2488.4	355.90	2651.9	1.1343	7.5445
90	70.14	0.001036	2.361	376.85	2494.5	376.92	2660.1	1.1925	7.4791
95	84.55	0.001040	1.982	397.88	2500.6	397.96	2668.1	1.2500	7.4159

Reference source

<http://users.abo.fi/rzevenho/ThermodynamicPropertyTableforsaturatedwater-temperature.pdf>