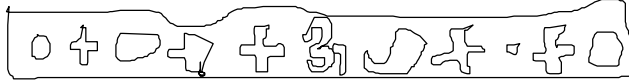


Women for Sustainable Development Voluntary Emissions Reduction Programme



Emission Reduction Creation Document For Environment Canada

Agro-Bio Chem Ltd
Telegi village, Harihar
Karnataka, India

.December 15th 2002

1.0 Introduction

Synopsis of facility:

Capacity: 1 X 250 Kg/hr + 1 X 500 Kg/hr Biomass Gasifiers

Power (Thermal): 2MWth

Process: Drying

Biomass: Marigold briquettes and Eucalyptus citridora branches and twigs

Commissioned on: 1998 (Gasifier 1) and 4th January 2001 (Gasifier 2)

Agro Biochem (India) Pvt. Ltd. is a company processing flowers for making natural dyestuffs. It has a marigold-processing unit situated in Telegi village, *Harihar, Karnataka*. Drying is one of the major processes in the company. Formerly liquid fuel was used for drying, which was inefficient and environment unfriendly. The Gasifier system was introduced here for utilising the waste generated in the industry and replace diesel/furnace oil used in the fluid bed drier thus reducing the fuel cost to a major extent. Two gasifier systems of 250Kg/hr and 500 Kg/hr were installed to generate about 2 MWth thermal power.

The *Producer gas* generated by the Gasifier is drawn through a Blower to a burner where combustion takes place. After combustion of the gases it is farther diluted by ambient air to produce clean hot gas at 100°C and is fed to two Dryers. The system uses the wastes from the Harihar Polyfibre factory as fuel, which is Eucalyptus citridora branches and twigs; it also uses the residue from the marigold flower after the chemical extraction. The waste from the Marigold, which is in powder form, is made into briquettes using a briquetting machine. This then forms the secondary fuel for the Gasifier system.

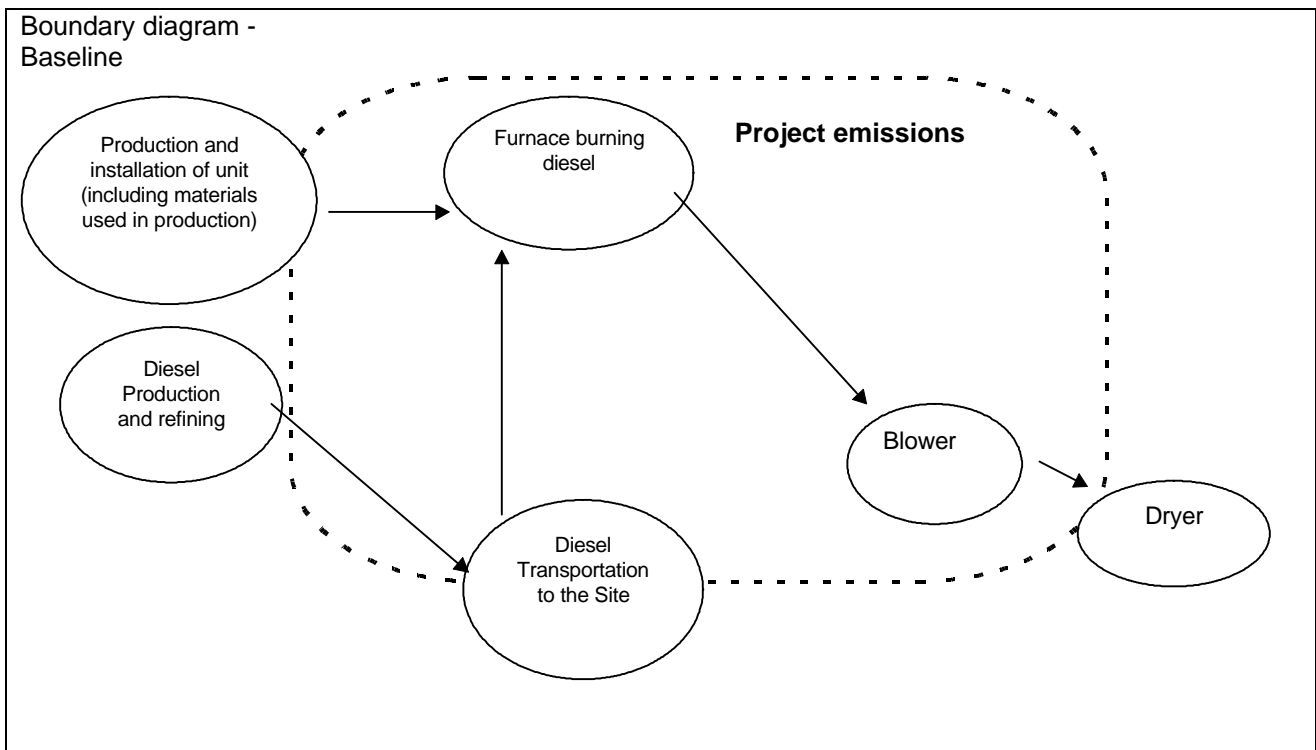
Prior to installation of the biomass gasification systems the fossil fuel consumption was approximately 100 litres of diesel per hour in one drying unit and 135 litres per hour in the second unit. The Emission Reductions achieved after installation of the gasifiers is approximately 1143 tCO₂ per annum.

2.0 Proponent Identification

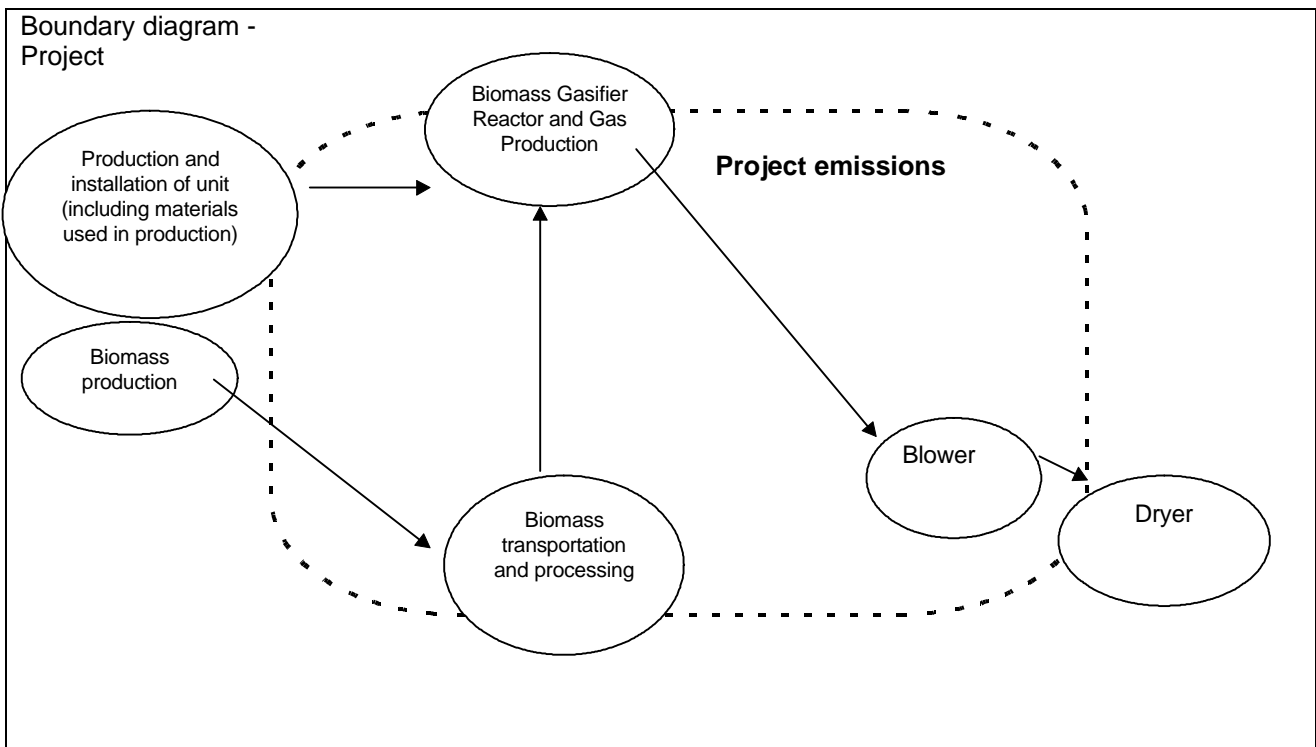
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Site phone: (0)8441 01056 (mobile)

3.0 Emission Reduction Project



Only the replacement of the diesel furnace with the biomass gasifier is considered. Electricity consumption in the blower and dryer (which are the same in both systems), and emissions associated with fuel processing and transportation (which have not been quantified in either case) are outside the boundary.



3.1 Pre-Project Conditions

The Marigold Drying Facility was established in 1995 and used to dry an average of 35 tons of Marigold per month. The diesel consumption during that time was recorded in a logbook and on average 95 litres of diesel was consumed. The expense involved was such that when the opportunity arose to collaborate with Netpro Renewable Energy Pvt Ltd the owners made use of the opportunity and installed a biomass gasifier in 1998. The

facility was upgraded with the addition of 1 more gasifier in 2001. As the transportation of the wood is taken care of by the Harihar Polyfibre factory and is done as part of their transport activities, the emissions associated with transportation of biomass in lorries has not been included in the project boundary.

3.2 Emission Reduction Strategy

October 1998 - Commissioning of 250 kg/hour Gasfier 1
 January 2001 - Commissioning of 500 kg/hour Gasfier 2

3.3 Post-Project Conditions

Monitoring date	Operating hours (D)	kg wood consumed (D)	kg/hour (F)	kcal/hour (F)	kcal/day (F)	KWh thermal/day (F)	kcal/month (F)	Marigold Production kg (D)
01-Oct-98	35	14705	420	1470500	2058700	2394	51467500	6700
01-Nov-98	225	94256	419	1466204	13195840	15344	329896000	45195
01-Dec-98	266	80696	303	1061789	11297440	13137	282436000	57600
01-Jan-99	504	148308	294	1029917	20763120	24143	519078000	125000
01-Feb-99	98	28000	286	1000000	3920000	4558	98000000	24300
01-Aug-99	52	7840	151	527692	1097600	1276	27440000	7000
01-Sep-99	312	71168	228	798359	9963520	11585	249088000	63511
01-Oct-99	334	76408	229	800683	10697120	12439	267428000	77409
01-Nov-99	317	82764	261	913798	11586960	13473	289674000	134982
01-Dec-99	353	92011	261	912290	12881540	14979	322038500	141430
01-Jan-00	420	97972	233	816433	13716080	15949	342902000	154360
01-Feb-00	230	54398	237	827796	7615720	8855	190393000	89785
01-Mar-00	43	8344	194	679163	1168160	1358	29204000	16800
01-Sep-00	298	67074	225	787782	9390360	10919	234759000	84511
01-Oct-00	465	95014	204	715159	13301960	15467	332549000	108235
01-Nov-00	527	107583	204	714498	15061620	17514	376540500	191400
01-Dec-00	469	90579	193	675963	12681060	14745	317026500	177124
01-Jan-01	473	107157	227	792916	15001980	17444	375049500	172300
01-Feb-01	486	107730	222	775833	15082200	17537	377055000	184000
01-Sep-01	79	16528	209	732253	2313920	2691	57848000	29495
01-Oct-01	412	90221	219	766441	12630940	14687	315773500	150360
01-Nov-01	92	20040	218	762391	2805600	3262	70140000	26280
01-Dec-01	457	110896	243	849313	15525440	18053	388136000	135500
01-Jan-02	523	121258	232	811478	16976120	19740	424403000	145700
01-Feb-02	515	107492	209	730528	15048880	17499	376222000	136850
01-Mar-02	495	108343	219	766062	15168020	17637	379200500	151000
01-Apr-02	456	109643	240	841558	15350020	17849	383750500	155400
01-May-02	113	30019	266	929792	4202660	4887	105066500	35400
05-Jan-01	288	84691	294	1029231	11856740	13787	296418500	147700
01-Feb-01	371	112929	304	1065368	15810060	18384	395251500	219000
01-Sep-01	82	33443	408	1427445	4682020	5444	117050500	45885
01-Oct-01	18	7012	390	1363444	981680	1141	24542000	5100
01-Nov-01	125	51933	415	1454124	7270620	8454	181765500	50755
01-Dec-01	320	131717	412	1440655	18440380	21442	461009500	125100
01-Jan-02	276	116509	422	1477469	16311260	18967	407781500	108500
01-Feb-02	266	86648	326	1140105	12130720	14105	303268000	79400
01-Mar-02	381	147417	387	1354224	20638380	23998	515959500	152000
01-Apr-02	309	119257	386	1350807	16695980	19414	417399500	135797
01-May-02	269	112353	418	1461842	15729420	18290	393235500	116515

After commissioning the first gasifier all diesel consumption in the first drier was replaced with biomass consumption. The old systems were removed from the first drier. The same was done again for the second drier. Diesel cannot be burnt in the new system. There is no technical possibility of diesel leakage or any other unaccounted emissions taking place. The output remains the same as was the case when the diesel-based systems were in operation.

4.0 Mandatory Criteria for Emission Reduction Credits

4.1 Real

The project produces real, net emissions by using a renewable source of fuel instead of diesel. The equipment replaced the previous equipment and emission reductions are taking place after the installation date of the new equipment.

4.2 Surplus

There is no government regulation that states that this equipment should be installed. There is a Karnataka State target of meeting power requirements in the State from renewables to the extent possible, but this is a purely voluntary target that does not impose any obligations on any operator or supplier directly.

4.3 Quantifiable

The method is the following:

The calorific value of the wood used in the plant is measured.¹ The calorific value of diesel is established. The data from the plant providing the numbers of kg of wood burnt in Gasifier 1 and in Gasifier 2 is collected and the heat output is calculated (kg wood x cal value of wood). The calorific value of the heat is then divided by the calorific value of the diesel (kcal output / cal value of diesel) to establish the litres of diesel saved. The numbers are on a monthly basis.

4.4 Unique

Currently there are not requirements for reporting Emission Reductions from individual power plants to the national or State level authorities. Credited reductions once sold will be reported to the CDM nodal agency for certification.

4.5 Verifiable

The documents will be kept in the WSD office for 25 years. The documents will consist of:

Signed biomass consumption figures: logsheet copies
Signed dried Marigold production figures: logsheet copies
Signed operating hours data: logsheet copies
Worksheets copying the data into Excel files and calculating the ERCs

5.0 Quantification of Emission Reductions

The method is the following:

The calorific value of the wood used in the plant is measured.² The calorific value of diesel is established. The data from the plant providing the numbers of kg of wood burnt in Gasifier 1 and in Gasifier 2 is collected and the heat output is calculated (kg wood x cal value of wood). The calorific value of the heat is then divided by the calorific value of the diesel (kcal output / cal value of diesel) to establish the litres of diesel saved. The numbers are on a monthly basis.

Justification: this is the best method. Other methods (such as measuring the calorific value of the heat output at the burner or blower) are not as accurate.

5.1 Data Collection

¹ CGPL - IISC-gf-details-ABC-12thSept 02

² CGPL - IISC-gf-details-ABC-12thSept 02

Example of Measurements taken on a daily basis at ABC. (Calibration of weighing machines has not been done as yet.) . P = Gas Pressure reading T = Temperature reading.

Date	Day	Time	Shift	P1	P2	P3	T1	T2	T3	Sand bed mins	Carbon bed mins	Bio-mass used (Kgs)	Ash/charcoal removed (Kgs)	Flower dried (Kgs)	Back wash Details
15.01.02	Tues	14.00	A	78	541	-	439	37	101						
		15.00		98	532	-	543	40	107						
		16.00		98	550	-	576	41	98			1419	333	1100	
		17.00	B	122	550	-	568	45	109						
		18.00		121	540	-	599	46	101						
		19.00		118	530	-	601	47	103						
		20.00		128	565	-	610	49	101						
		21.00		140	590	-	611	50	98						
		22.00		148	577	-	629	51	99						
		23.00		160	600	-	619	51	98						
		24.00		168	590	-	616	51	98			3315	105	3750	
		1.00	C	175	595	-	626	51	98						
		2.00		184	595	-	630	51	109						
		3.00		191	600	-	628	51	110						
		4.00		181	599	-	630	52	100						
		5.00		198	597	-	637	55	99						
		6.00		195	590	-	630	54	101						
		7.00		199	593	-	641	57	103						
		8.00		189	595	-	643	53	99			3272	136	3250	

5.2 Baseline Determination

The baseline is diesel as this was the fuel used before implementation of the gasifier project.

5.3 Emission Reduction Calculation

	A	B	C	D	E	F	G	H
Monitoring date	Operating hours (D)	kcal/kg wood (D)	kg wood consumed (D)	kcal/month (F) - wood number	Diesel kcal/litre (D)	Diesel replacement in litres (F)	1 litre of diesel 2.68 kg of CO2 (F)	tCO2 savings (F)
01-Dec-01	320	3500	131717	461009500	8859	52038.55	139463	139
01-Jan-02	276	3500	116509	407781500	8859	46030.20	123361	123
01-Feb-02	266	3500	86648	303268000	8859	34232.76	91744	92
01-Mar-02	381	3500	147417	515959500	8859	58241.28	156087	156
01-Apr-02	309	3500	119257	417399500	8859	47115.87	126271	126
01-May-02	269	3500	112353	393235500	8859	44388.25	118961	119
	2705	3500	1003909	3513681500	8859	396622.81	1062949	1063

The above table provides examples of months when Emission reductions took place. It is not the whole monitoring record but is given to explain the steps taken for calculating the ERs.

Steps:

- 1 - Enter Recorded Data of Operating Hours in column A
Enter kcal/kg of wood figure in column B
Enter Recorded Data of kg wood consumed in column C
Enter kcal/litre diesel in column E

7.0 Other Impacts

Water and wastewater: Water used for cleaning gas is washed in charcoal bed filter sump and recirculated.

Air: Gas quality has been tested according to international testing standards and is found to be within all international emissions norms:

Average Lower Calorific Value: 4.6 ± 0.2 MJ / kg

Average Specific Weight: 1.12 kg / Nm³

Average Composition [vol. %]:

CO	H ₂	CH ₄	O ₂	CO ₂	N ₂	H ₂ O
18.0 ± 2.0	19.0 ± 0.7	1.2 ± 0.5	0.1 ± 0.1 (max. 0.2)	12.5 ± 1.0	46.2 ± 1.5	3.0 ± 0

Average Tar and Particulate contents in mg/ Nm³ :

	Hot gas from reactor	Cold + washed gas
Tar	70 ± 30	< 40 ± 10
Particles	600 ± 100	< 30 ± 10

Solid waste: Charcoal removed from gasifier charcoal bed is dried and reintroduced into the gasifier.

Noise: The levels are within acceptable limits.

7.1 Internal Impacts

None. Some electricity consumption in the plant but this is the same as there was in the baseline case. So it is not considered.

7.2 External Impacts

None. As the biomass is being generated for the neighbouring plant in any case no additional biomass generation is taking place for this plant.

7.3 Permanence

The project undertaken is a permanent modification and would continue in service for the life of the facility.

8.0 Documents Examined

1) WSD Registration Form Agro-Bio Chem Pvt Ltd AS 9th November 2002, WSD November 2002

2) Monitoring Data Agro Bio 10th Dec 02, WSD December 2002

3) CGPL - IISC-gf-details-ABC-12thSept 02, unpublished, Agro Bio Chem Pvt Ltd

4) Netpro, Summary Of The Official Report, **Xylowatt**- Combined heat power plant with wood, IISC-DASAG gasifier with a gas engine, by P Giordano (co-ordinator), Centre de Compétence of Châtel-St-Denis, c/o Xylowatt Ltd 1618 Châtel-St-Denis Summary prepared by, DASAG Energy Engineering Ltd., Birchstrasse 6, CH-8472 Seuzach, Switzerland. August 2000

9.0 Addenda

None