CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Title : Forced methane extraction from Organic wastewater at Mandya district, Karnataka by M/s. Sri Chamundeswari Sugars Ltd,.

Version of the PDD : Version 05

Date of the document : 12/01/2007

A.2. Description of the small-scale project activity:

Purpose of the project activity

The main purpose of the project activity is the installation of a closed anaerobic digestion[1] system to extract methane rich biogas from organic wastewater generated at the distillery of Sri Chamundeswari Sugars Ltd. The biogas is collected and utilized as fuel in boilers to produce steam and the steam is utilized to produce electricity. The organic wastewater from distillery also known as spentwash is diverted from existing open anaerobic lagoon treatment system into closed anaerobic reactors to recover methane rich biogas and utilise the methane as fuel to generate steam and electricity. The emission reductions due to recovery of methane alone are considered as emission reductions of the project activity. The emission reductions due to displacement of fossil fuel by generation of steam and electricity utilising the biogas generated from the steam is not considered for reasons explained in appropriate sections in this PDD.

Description of project activity

Sri Chamundeswari Sugars Ltd (SCSL) has a sugar mill with 4000 tonnes crushing capacity per day (TCD) and a distillery with production capacity of 50,000 litres of alcohol per day at Bharathinagara in KM Doddi village in Karnataka state in India. Distillery utilizes molasses, a bye –product of the sugar mill, for production of alcohol. The wastewater from distillation process has high organic content and the organic content is measured in terms of chemical oxygen demand (COD) and biological oxygen demand (BOD). The spentwash has to be treated to bring down the levels of COD and BOD to prescribed standards of environmental authorities. SCSL treated this organic wastewater in open anaerobic lagoons and after treatment in open anaerobic lagoons, the wastewater was mixed with pressmud[2]. The mixture was aerobically composted to produce organic manure and sold to farmers. This mode of disposal,

[1] Anaerobic digestion is the decomposition of organic matter under anoxic conditions (absence of oxygen).

[2] Pressmud is a nutrient rich slurry waste produced by dewatering the sediments of the sugarcane juice in the sugar mill.

although was acceptable to environmental authorities and easy to operate was releasing lot of greenhouse gases (GHG) into the atmosphere apart from loosing large quantities of energy that could be recovered.

The wastewater due it high organic content when subjected to anaerobic degradation, produces biogas. Biogas mainly consists of methane and carbon dioxide and is a valuable fuel. SCSL realizing the effects of greenhouse gases being released into atmosphere from open anaerobic lagoons and appreciating the importance of recovering valuable energy from the wastewater, had decided to establish a biogas recovery plant through an anaerobic digestion system and utilize biogas as fuel to generate steam and electricity.

Plant capacity

The anaerobic digestion plant is designed to handle 600 m^3/day of wastewater with a COD of 150 $kg/m^3$and BOD of 50 kg/m^3. However, the maximum flow so far that has been handled is 500 m^3/day and minimum flow is 400 m^3/day and hence all estimations are based on the average value of 450 m^3/day. Regarding COD, plant is designed for a value of 150 kg/m^3. The minimum value of COD occasionally handled is 140 kg/m^3. Hence, the estimations are based on the average value of 145 $kg/m^{3.}$

The wastewater treatment can be broadly divided into following sections:

i. Pre-treatment
ii. Biomethanation
iii. Utilization of biogas
iv. Post –treatment

i) Pre-treatment

The organic wastewater discharged from the distillery is collected in a holding pit. From holding pit, it is pumped to a settling tank where settlable solids present in the wastewater settles and is removed. The overflow from settling tank flows to a buffer tank. The volume of the buffer tank is 300 m^3, sufficient to hold two-thirds of daily discharge. The pH of the wastewater is in the range of 5-5.5. Lime solution is added to raise the pH of wastewater to 6.5 for effective degradation of organics. Microbial activity is at optimum when the pH of the substrate is in the range of 6.5 - 8. Nutrients like urea, di ammonium phosphate and micronutrients like ferric chloride are added in the buffer tank, if required, to supplement the nutrient requirement.

ii) Biomethanation

The wastewater is then subjected to anaerobic treatment in closed anaerobic reactors. Upflow Anaerobic Sludge Blanket (UASB) type of anaerobic reactors is employed in the project activity. The wastewater from buffer tank is pumped to UASB reactors. Two UASB reactors each of 26 meters diameter and 9.5 meters height are provided for anaerobic digestion. The effective liquid height in UASB reactors is 9 meters and therefore effective liquid volume is 4780 cubic meters in each UASB reactor. The wastewater enters the reactors from the bottom of the reactor through a distribution pipeline grid. Holes are provided in the distribution pipeline and when wastewater is pumped in the pipeline, the effluent enters the reactors through these holes uniformly. The wastewater flows in an upward direction in the digesters through an anaerobic sludge bed where it mixes with micro organisms in the sludge bed.

The treatment of wastewater through anaerobic treatment involves following three step process:

i) Hydrolysis
ii) Acidogenesis
iii) Methanogenesis.

The process of hydrolysis takes place in buffer tank, which is the preparatory step for acidogenesis and methanogenesis reactions. Acidogenesis and methanogenesis take place in digesters. Acidogenesis reactions break the complex organics in the wastewater into acids and these acids are further destroyed into basic compounds of methane (CH_4) and carbon dioxide (CO_2,) the mixture of which is known as biogas. Temperature is one of the main parameters for effective degradation of the organics. The anaerobic reactions occur when the digester temperatures are above 25° centigrade (C) and are at optimum at still higher temperatures in the range of 30 –37°C. The temperature of the UASB contents is always between 30 -37°C and thus anaerobic reactions are at optimum levels. The high ambient temperatures present in southern part of India throughout the year ensure maintenance of desired range of temperatures in UASB reactors without the need for any external heating. The resulting anaerobic degradation produces biogas. Biogas is a mixture of CH_4 and CO_2. Biogas produced rises upward through the sludge along with the wastewater. At the top of the reactor, the water phase is separated from solids and gas in a three phase separator (also known as gas –liquid -solid separators - GLSS). The three phases are gas is biogas, liquid is treated wastewater and solid is the sludge in the wastewater. Gas is collected separately, subjected to water cleaning in gas washer system and buffered in a gasholder before being used as fuel. The liquid, that is, the treated wastewater, overflows to a ‘treated wastewater collection tank’ and solids in the liquid slide down into the UASB reactor. The biogas is drawn and transferred by booster blowers to the existing cogeneration system.

iii). Utilization of biogas

The biogas is burnt as fuel in boilers along with bagasse in existing cogeneration system to produce steam. The steam is utilized in turbines to produce electricity.

Details of power generation system

S.No.	Name of the equipment	Capacity
1	Boiler I	45 TPH, 350ºC, 21 kg/cm^2
2	Boiler II	45 TPH, 350ºC, 21 kg/cm^2
3	Boiler III	10 TPH, 350ºC, 10 kg/cm^2
4	Turbine I	2.5 MW
5	Turbine II	2.5 MW
6	Turbine III	2.0 MW

The electricity requirements of the industry are met from own generation from bagasse (solid waste from sugar mill) based cogeneration system, from the state owned grid and from own diesel fired generator. When bagasse is available, electricity is generated using bagasse (a biomass), as fuel in the power generation system. The biogas generated from the project activity will also be utilized as fuel in the boilers to produce steam, which is subsequently consumed in turbines to produce electricity.

When bagasse is not available, electricity required for the operation of sugar mill and distillery is drawn from the grid and diesel generator (DG). During this period, the generated biogas from the project activity shall be used in the 10 TPH low pressure boiler to produce steam which is used for distillery operations. Thus biogas is utilized as fuel to produce steam and electricity reducing/displacing the withdrawal of electricity from the grid and diesel fired generators and its associated GHG emissions. **However, since major component of the heat and electricity requirements are met from bagasse, a biomass, emission reductions due to displacement of fossil fuel by generation of steam and electricity using biogas is not considered for conservatism.**

iv) Post treatment

The wastewater leaving the UASB reactors is collected in a treated wastewater collection tank from where the wastewater is transported to biocompost yard. The wastewater is unloaded into the existing open lagoons. From the lagoons. the wastewater is then mixed with pressmud and aerobically composted in windrows to produce manure. A dosing tank is fitted to the compost turning machine (compost tiller). The wastewater from the anaerobic lagoons is pumped to the dosing tank. Tilling is a process, which turns the composting material upside down. While tilling, the material at the bottom of the windrow comes to the top and top material is taken to the bottom. This process ensures maximum aeration to all the material and enhances manure quality. While tilling the windrow, the wastewater is added to the pressmud in the windrow and the tilling equipment mixes well pressmud and treated wastewater. The pressmud mixed with treated wastewater is a better enriched organic compost and sold to farmers at a nominal price. Thus no wastewater is discharged on land or into any water bodies and all wastewaters are consumed ensuring a “zero discharge”.

Explanation how the project activity reduces greenhouse gas emissions

The project activity reduces greenhouse gas emissions in two ways :

i. The project activity diverts the organic wastewater from existing open anaerobic lagoon treatment system to closed anaerobic treatment system thereby preventing the release of methane, a GHG, into the atmosphere.

ii. The generated methane rich biogas is utilised as fuel to generate heat and electricity, which displaces electricity consumed from on site diesel fired generator and grid; thereby reducing the GHG emissions associated with diesel firing and grid electricity generation. The emission reductions are not claimed due to reasons already mentioned.

Project’s contribution to sustainable development

Wastewater, the wastewater from distillery is treated like other process wastewaters to meet environmental standards before being discharged. The cheaper and the common treatment system used for treatment of spentwash is treatment in open anaerobic lagoons and then mixed with pressmud to produce organic manure. Although this system is sufficient to meet the disposal standards required by the environmental authorities, this method of treatment releases significant amount of greenhouse gases into the atmosphere. The organics in the wastewater undergoes anaerobic degradation in the open anaerobic lagoons and liberate biogas consisting mainly of methane (CH_4) and carbon di oxide (CO_2), which could not be collected, were released to atmosphere. The construction of closed anaerobic digestion system to treat spentwash has many environmental and sustainable development benefits.

Contribution to sustainable development is generally measured through following attributes :

- Social well being
- Economic well being
- Environmental well being
- Technological well being

i) Social well being and Economic well being

The project activity provided direct and indirect employment to the local community during construction of the project activity and as well as during operation. During construction, employment were offered for lot of unskilled labour contributing in poverty alleviation leading to social well being and economic well being. The project activity had an investment of US$ 846,000 (Rs37.05 Millions). All these have contributed to economic well being of the local community.

ii) Environmental well being

The project activity is an environmental project treating organic wastewater recovering biogas and utilizing the same. This *prevents* the release of greenhouse gas emissions to the atmosphere leading to the environmental well being.

iii) Technological well being

The project activity employs a technology called upflow anaerobic sludge blanket (UASB) technology, which is a recent *development* in anaerobic treatment of organic wastewater. Successful operation of the project activity would lead to replication of such projects contributing the technological well being.

The sustainable development contribution can be summarized as follows :

i. Generation of direct and indirect employment

ii. Prevents release of large quantities of CH4, a potent GHG, from being emitted into atmosphere.

iii. Collection and utilization of methane as a fuel to generate steam and power contributes to the development of renewable energy.

iv. Utilization of biogas to produce electricity replaces electricity that would have otherwise been produced from the fossil fuel with its associated GHG emissions.

v. Reduction of pollution through an energy saving technology.

vi. Reduction of bad odors as most of the odor producing reactions occur in closed anaerobic digesters.

A.3. Project participants:

Name of Party involved (host indicates a host Party)	Private and/or public entity (ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	Sri Chamundeswari Sugars Limited (SCSL) (Private entity)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

India

A.4.1.2. Region/State/Province etc.:

South India/Karnataka State/ Mandya district

A.4.1.3. City/Town/Community etc:

Bharathinagara, KM Doddi.

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project activity is located within the premises of Sri Chamundeswari Sugars Ltd (SCSL) in Bharathinagara in KM Doddi village in Maddur Taluk in Mandya district in Karnataka state in India. Bharathinagara is about 110 kilometers from Bangalore city, the capital of Karnataka state. KM Doddi is well connected by road to all parts of Karnataka and rest of the country. The nearest railway station is at Maddur, which is 22 kilometers from Bharathinagara. Maddur is well connected to all important cities of Karnataka by train and is on the busy Bangalore – Mysore route. The nearest airport is at Bangalore, which is an international airport. SCSL is located among good sugarcane producing areas. The region receives most of its rainfall during the months of June –September.
The physical coordinates of the project activity are : 12º 23’N and 77º 01’N

The geographical location in which project activity is located is shown in following figures :

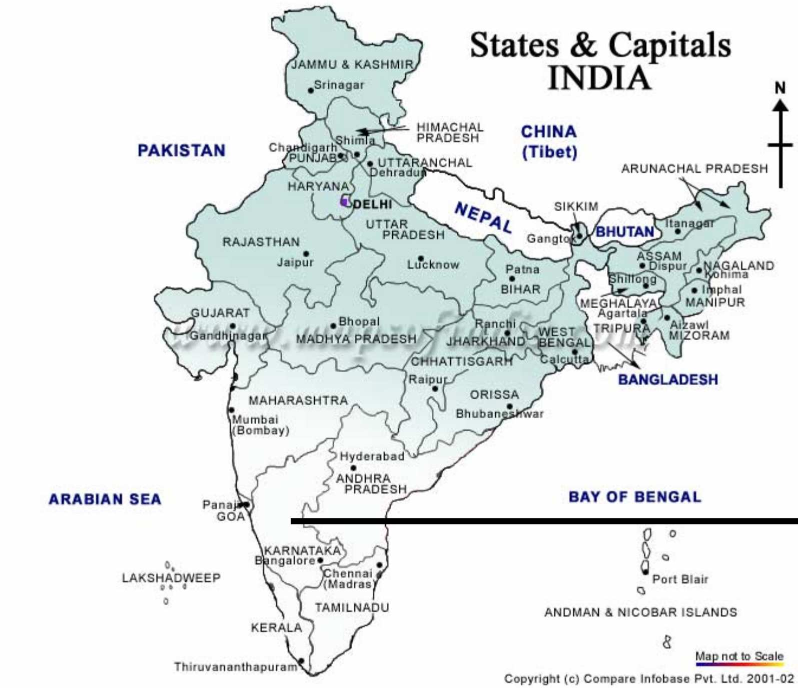


Fig -1- Map showing Karnataka state in INDIA Map

Karnataka state

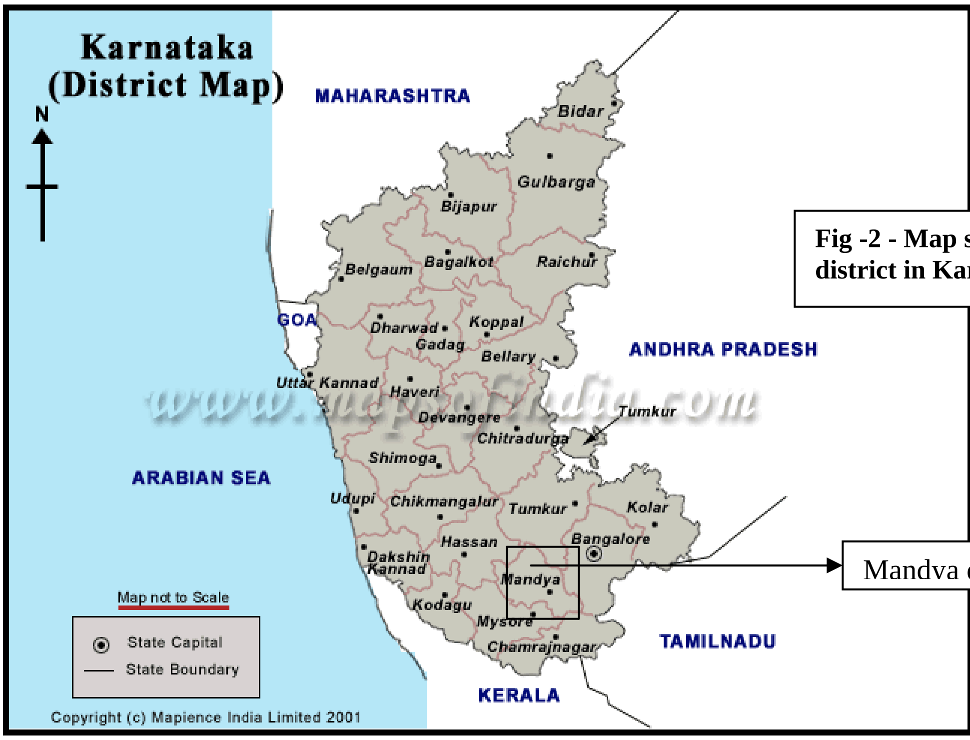


Fig -2 - Map showing Mandya district in Karnataka state

Mandva district

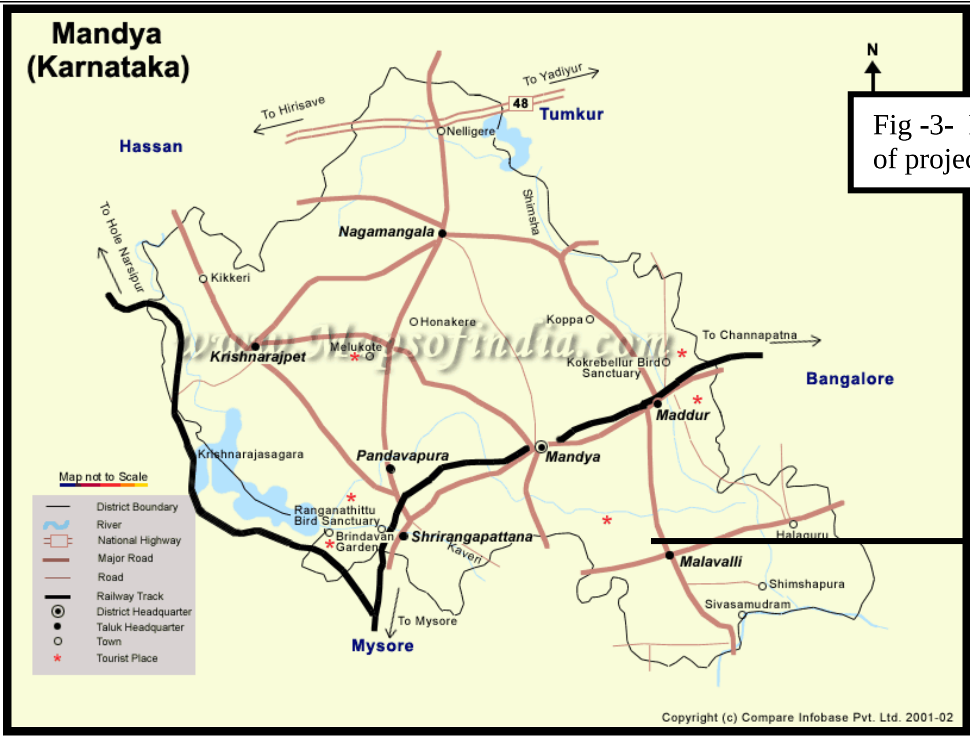


Fig -3- Map showing location of project activity

SCSL – Location of the project activity

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

As per Appendix B to the simplified M&P for small-scale CDM project activities, the small scale project activity has applied the approved small scale methodology as follows:

Type	:	III. Other Project Activities
Category	:	Type III.H - Methane recovery in waste water treatment
Scope Number	:	13
Sectoral Scope	:	Waste handling and disposal

Technology/Measure :

The approved small scale methodology AMS III.H/ version 4 dated 23 December 2006 – Methane recovery in wastewater treatment -ccomprises measures that recover methane from biogenic organic matter in wastewaters by means of one of the following options:

(i.) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with methane recovery and combustion.

(ii.) Introduction of anaerobic sludge treatment system with methane recovery and combustion to an existing wastewater treatment plant without sludge treatment.

(iii.) Introduction of methane recovery and combustion to an existing sludge treatment system.

(iv.) Introduction of methane recovery and combustion to an existing anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an onsite industrial plant.

(v.) Introduction of anaerobic wastewater treatment with methane recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream.

(vi.) Introduction of a sequential stage of wastewater treatment with methane recovery and combustion, with or without sludge treatment, to an existing wastewater treatment system without methane recovery (e.g. introduction of treatment in an anaerobic reactor with methane recovery as a sequential treatment step for the wastewater that is being presently treated in an anaerobic lagoon without methane recovery.)

Since the project activity is a methane recovery and combustion activity from biogenic organic matter to an existing wastewater treatment system of lagoons as per option (vi) above,

<u>Technology employed in the project activity</u>

The technology employed is anaerobic digestion with upflow anaerobic sludge blanket (UASB) technology. UASB process is an advanced anaerobic treatment for wastewaters with high concentration of organic matter and with low or medium concentration of suspended solids. Conventional anaerobic processes for liquid wastes were operated either as a completely mixed reactor where mixing was achieved by recirculation pumps or agitators; or as attached growth systems with media for development of microbes. UASB process is advancement over these anaerobic technologies and was developed on the basis that the anaerobic sludge has superior flocculation and settling characteristics. When wastewater enters the reactor, a sludge bed – “sludge blanket” - is produced at the bottom of the reactor by highly active and fast settling bacterial granules. This natural form of micro organism aggregation allows the retention of anaerobic biomass in the reactor, without the need of expensive or volume displacement packing materials

The wastewater is uniformly introduced into the reactor by the distribution system on the bottom of the reactor and passes through the “sludge blanket”. Uniform inlet of wastewater is ensured by allowing wastewater through holes in the inlet pipelines. During the up flow path, the organic matter in the wastewater is taken by the micro organisms (granules) for their metabolic needs, resulting mainly in biogas, a mixture of CH_4 and CO_2. At the top of the UASB reactor, separators known as gas –liquid – solid separators (GLSS) are placed to separate the three phases that are formed in the anaerobic reactor. The gas phase is the biogas generated due to anaerobic degradation of organics and this gas is collected through a common collecting pipe and taken to a gasholder. The liquid phase is the treated spentwash, which overflows to a launder and is taken to a collection tank. The solids phase is the sludge that rises along with liquid. This sludge slides along the separators and falls into the reactor maintaining granular population in the UASB reactor. The pelletized form and the high density of the sludge prevent the washout of micro organisms by the up flow pattern. By means of the three phases separator, the biogas is collected, the suspended solids are retained and sent back to the sludge zone, and the wastewater is clarified.

UASB process is a combination of physical and biological processes. The physical process is separation of solids and gases from the liquid and that of biological process is degradation of organic matter to form biogas. Features generally provided in conventional anaerobic reactors such as separate settlers, sludge return pump, mixing pump, agitators or filter media are not required for UASB reactors. For achieving the required sufficient contact between the sludge and the wastewater, UASB system relies on the agitation brought about by the natural gas production and a uniform inlet distribution at the bottom of the reactor.

The compact design of this kind of reactors, in fact includes several stages in one tank: primary treatment, since the suspended solids in the wastewater are retained in the sludge blanket (by means of a filtration effect); secondary treatment, as it removes the organic soluble matter; and a secondary clarifier in the top of the tank. Besides, due to the long period of solids retention in the sludge blanket, they are partially stabilized and meet the requirements of a sludge treatment system (digester and thickener). Along with all this, biogas, a valuable form of energy, is produced.

Technology supplier : United Envirotech Pvt. Ltd., India.

United Envirotech Pvt. Ltd. (UEPL) is the technology provider for UASB process. The technology is indigenous and is operating for organic wastewaters of pharmaceutical, distilleries etc; the technology is an advanced method of wastewater treatment process over conventional anaerobic processes.

The digestion process is indigenous and is operating for many wastewater treatment plants of distilleries, pharmaceutical units, etc., There is no transfer of technology. Regarding electricity generation, the gas engine is imported. This type of gas engine is in successful operation in many countries including India and these engines generally meet the environmental norms. The emissions from the gas engine are within the norms when let out through the stack as the H_2S, which is the most hazardous constituent, is reduced by scrubbing before the biogas is fed to the gas engine. Thus an environmentally safe technology is installed in the project activity.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The estimated amount of emission reductions from the small scale project activity over the chosen crediting period is given in Table A -1.

Table A-1 – Estimated amount of emission reductions

S.no	Year	Annual estimation of emission reductions (ton CO_2 e)
1	2007 - 2008	34,424
2	2009-2010	34,424
3	2010-2011	34,424
4	2011-2012	34,424
5	2012-2013	34,424
6	2013-2014	34,424
7	2014-2015	34,424
8	2015-2016	34,424
9	2016-2017	34,424
10	2017-2018	34,424
	Total estimated reductions	**344,240**
	Total number of crediting years	10 years
Annual average over the crediting period of estimated reductions		**34,424 t CO_2e**

A.4.4. Public funding of the small-scale project activity:

There is no Official Development Assistance (ODA) or public funding from Annex –1 Parties for the project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The current project activity is not a debundled component of a larger project activity because the project proponent has not registered any small scale CDM project activity or applied for registration another small scale CDM project activity within 1km of the project boundary of the proposed CDM project activity , nor registered within the previous 2 years in the same project category and technology/measure.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

Scope number	:	13
Sectoral scope	:	Waste handling and disposal
Type	:	III- Other Project Activities
Title of the approved baseline methodology	:	Methane recovery in waste water treatment
Reference of the approved baseline methodology	:	AMS III.H./ Version 04 dated 23 December 2006

B.2 Justification of the choice of the project category:

Appendix B of the simplified M&P for small-scale CDM project activities provides indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. As per the M&P, the project activity falls under the following approved small scale methodology AMS III. H - Methane recovery in waste water treatment / Version 04 dated 23 December 2006.

Justification of the small scale project activity as per technology/measure of AMS III.H / Version 04 dated 23 December 2006

The applicability conditions of approved baseline methodology in the context of the project activity are given in the following table in Table B.2-1:

Table B.2-1 – Justification of choice of the project category

S.No,	Technology /Measure as per AMS III.H/version 04	Measure of project activity
1	This project category comprises measures that recover methane from biogenic organic matter in wastewaters by means of one of the following options: (i.) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with methane recovery and combustion (ii.) Introduction of anaerobic sludge treatment system with methane recovery and combustion to an existing wastewater treatment plant without sludge	The small scale project activity is the installation of Introduction of a sequential stage of wastewater treatment with methane recovery and combustion, with or without sludge treatment, to an existing wastewater treatment system without methane recovery as per option (vi).

	treatment. (iii.) Introduction of methane recovery and combustion to existing sludge treatment systems. (iv.) Introduction of methane recovery and combustion to an existing anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an onsite industrial plant. (v.) Introduction of anaerobic wastewater treatment with methane recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream. (vi.) Introduction of a sequential stage of wastewater treatment with methane recovery and combustion, with or without sludge treatment, to an existing wastewater treatment system without methane recovery (e.g. introduction of treatment in an anaerobic reactor with methane recovery as a sequential treatment step for the wastewater that is being presently treated in an anaerobic lagoon without methane recovery.)	
2	Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	The estimated annual emission reductions of the project activity are 34.424 kt CO_2 equivalent which is less than 60 kt CO_2 equivalent. It is also stated that the project activity will not exceed 60 kt CO_2 during the crediting period.

Since the project activity meets all the technology /measures of the approved baseline methodology AMS III.H/version 4 dated 23 December 2006, the project category is chosen for the project activity.

B.3. Description of the project boundary:

The project boundary as per version 04 of AMS-III.H, is given in para 4, which is "the project boundary is the physical, geographical site where the waste water and sludge treatment takes place".
The project boundary comprises of the following:

- Methane recovery system consisting of pre-treatment units, UASB reactor, collection tank.
- Post treatment system consisting of anaerobic lagoons and compost yard.
- Flare

B.4. Description of baseline and its development:

The baseline of the project activity is as per option (vi) of para 6 of AMS III H/Version 04 which is, "the existing anaerobic wastewater treatment system without methane recovery for the case of introduction of a sequential anaerobic wastewater treatment system with methane recovery".
The project activity is introduction of methane recovery system for existing anaerobic wastewater treatment system to recover methane rich biogas which otherwise would have been emitted from open anaerobic lagoons. Thus methane is captured thereby preventing release of CH_4 to atmosphere. Hence, the applicable emission baseline is the amount of methane that would be emitted to the atmosphere during the crediting period in the absence of the project activity.
So baseline emissions of the project activity are CH_4 emissions in the absence of the project activity from anaerobic lagoons.
The baseline emissions for the applicable baseline is as per section 7. (d)of the AMS III H/Version 04 which is given below :

$$BE_y = Q_{y, ww,} * COD_{y, ww, untreated} * B_{o, ww,} * MCF_{ww, treatment} * GWP\_CH_4$$

Where BE_y is baseline emissions in the year "y" (tCO_2e)

$Q_{y, ww}$ is volume of wastewater treated in the year "y"

$COD_{y, ww, untreated}$ is chemical oxygen demand of the wastewater entering the anaerobic reactor in the year, "y" (tonnes/m^3)

$B_{o, ww}$ is the methane producing capacity of the wastewater (IPCC lower default value 0.21 tonnes CH_4 / tonnes COD)

$MCF_{ww, treatment}$ is the methane correction factor for the existing wastewater treatment system to which the sequential anaerobic treatment step is being introduced (MCF lower value in Table III.H.1)

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

The implementation of the methane recovery and utilization to generate electricity is a voluntary step undertaken by SCSL with no direct or indirect mandate by law. The main driving forces to this 'Climate change initiative' have been:

- GHG reduction by capturing methane rich biogas being emitted from lagoons and subsequent carbon financing against sale consideration of certified emission reductions.
- GHG reduction by producing electricity from captured methane rich biogas and thus displacing the fossil fuel dominated grid electricity.
- Capacity building in operation and maintenance of energy recovery plants and renewable energy generation plants.

However, the project proponent was aware of the various barriers associated to project implementation. But it was felt that the availability of carbon financing against a sale consideration of emission reductions generated due to project activity would help to overcome these barriers.

Although it is well known fact that, methane recovery and its utilization to generate electricity has various advantages, it is still not widely applied, particularly in the developing countries like India. For industries to venture into such an unexplored area, it is a steep diversification from their core industrial economics, where the project proponents needs to meet requirements and challenges of techno-commercial, social, issues etc. associated with the project activity.

There is no statutory requirement to implement methane recovery system for SCSL and there were no emission standards for methane from anaerobic lagoons. Treating its organic wastewater through anaerobic lagoons followed by mixing with pressmud and composting the mixture aerobically, sufficiently met environmental norms. This way, there was no discharge of any liquid wastewater from the premises and this ensured close to most desirable "Zero discharge". Anaerobic lagoons were operating smoothly and SCSL was comfortably meeting the requirements of environmental authorities. However, aware of effects methane to the environment, SCSL had invested in the project activity to recover methane rich biogas and utilise the biogas as fuel in heat generation equipment to produce steam and steam is used to generate electricity.

Demonstration of Additionality

As per the attachment A to Appendix B of the simplified M&P for small-scale CDM project activities of the UNFCCC CDM website, to prove that the project is an additional, explanation regarding the project activity would not have occurred anyway due to at least **one** of the following barriers is required:

(i.) Investment barriers
(ii.) Technological barriers
(iii.) Barrier due to prevailing practice
(iv.) Other barriers

Methane capture and electricity generation project had its own barriers for implementation, which had to be overcome by SCSL to implement the project activity and to reduce green house gas emissions. Although discussion of one of the barriers is adequate for a small scale project activity, all barriers discussed to show that the project activity had several barriers.

The barriers faced by the project activity are discussed below:

Investment Barriers

The project activity has a high capital cost with. An investment analysis of the project activity was conducted with the Internal Rate of Return as the financial indicator. 'Internal Rate of Return' is one of the known financial indicators used by project developers, banks, and financial institutions for making investment decisions.

The income from the project activity is due to the steam generation using methane rich biogas as fuel, replacing bagasse. The cost of bagasse replaced by biogas based on the calorific value of bagasse and biogas is considered for estimation of IRR for the project activity.

The IRR of the project was estimated with the following project specific figures:

Table B.3-5.1 - Project Cost

Parameters	**Value in US Dollars [3]**
Project development costs	43,478
Engineering, procurement and construction costs	595,761
Other costs (including labour costs, project administration costs, interest during construction)	167,826
Total cost of the project	807,065
Equity investment	203,804
Debt component	603,261
Rate of interest for debt component	12 %
Operation and maintenance cost including cost of administration, fuel, spares etc., per year	89,836
Revenue from utilization of biogas based on cost of bagasse per year	195,750
Internal rate of return of the project	**8 %**

The detailed calculations of the IRR workings are attached as Annex 1 in a spread sheet. It may be seen that IRR for the project is only 8 %, which is not attractive for investment in any project.

An IRR of 14 -16 % is the project proponent's desired value for an investment. This is comparable with the standard returns in the Indian market. Central Electricity Regulatory Commission (CERC), India vide its order dated 16 January 2004 had specified the IRR for electricity generation projects to be 16 % which is the most commonly used benchmark value. This value was fixed by CERC after an elaborate consultation process from all the stakeholders including public sector utilities, private sector organisations, non governmental organisations etc., This shows that 16% is the standard returns in the Indian market.

The IRR of the project activity, which is 8%, is far lesser than the project proponent's expectations and standard returns in the market. However SCSL went ahead with the implementation of the project to prevent GHG emissions released to the atmosphere and with the expectations of realizing the revenue from the sale of CERs.

[3] 1 USD = 46 Indian Rupees

Technology Barriers

The implementation of Upflow Anaerobic Sludge Blanket (UASB) process based methane recovery project was first of its kind for SCSL and SCSL had no prior experience in operation and monitoring of such advanced anaerobic treatment processes. SCSL staff had to be trained by the technology provider in operation, maintenance, trouble shooting and monitoring of the UASB based anaerobic digestion plant. SCSL was meeting environmental requirements from the current existing lagoon system and training the staff in a new treatment method was a barrier.

UASB is an advanced anaerobic treatment system and one of the latest developments. The operation of UASB based is complex as compared to operation of anaerobic lagoons. In the case of anaerobic lagoons, very little operation is required where as in the case of UASB digester, several process parameters like acidity, alkalinity, temperature, loading rates, recirculation rates , etc., have to be monitored and maintained for optimum performance and sustained performance of the UASB system.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The emission reduction of the project activity is the difference between the baseline emissions and the sum of the project emissions and leakage.

$$ER_y = BE_y - (PE_y + Leakage)$$

Where ER_y is the emission reductions of the project activity for the year "y"(tCO_2 e)

BE_y is the baseline emissions in the year "y" (tCO_2e)

PE_y is the project activity emissions in the year, "y' (tCO_2 e)

Leakage is the leakage of emissions in the year,"y" (t CO_2 e)

Baseline emissions - BE_y

The baseline emissions is calculated by using the formula given in section 7 (d) of AMS III .H/Version 04 which is given below :

$$BE_y = Q_{y,ww,} * COD_{y,ww,untreated} * B_{o,ww,} * MCF_{ww,treatment} * GWP\_CH_4$$

BE_y is baseline emissions in the year "y" (ton CO_2e)

$Q_{y,ww}$ is volume of wastewater treated in the year "y" (m^3/year) which is calculated by multiplying volume of wastewater generated per day and number of operating days in a year.

COD $_{y, ww, untreated}$ is chemical oxygen demand of the wastewater entering the anaerobic reactor in the year, "y" (tons/m^3). This parameter is being analysed regularly by the project proponents in tonnes/m^3. Average value shall be used for estimation of ex-ante calculations and actual value would be used during monitoring and estimation of emission reductions of the project activity.

$B_{o, ww}$ is the methane producing capacity of the wastewater (ton CH_4/ton COD). IPCC default value is 0.25 ton CH_4/ ton COD. This value is corrected accounting uncertainties and a lower value of 0.21 ton CH_4 t/ ton COD would be adopted.

MCF $_{ww, treatment}$ is the methane correction factor for the existing wastewater treatment system to which the sequential anaerobic treatment step is being introduced (MCF lower value in Table III.H.1). The existing wastewater treatment system is "anaerobic deep lagoon (depth more than 2 metres). **The lower MCF value in Table III.H.1 is 0.8**

GWP_CH_4 is the Global Warming Potential of methane (21 ton CO_2e / ton CH_4)

Project Activity Emissions

As per AMS III.H/ Version 04, the project activity emissions **(PE_y)** consist of :

(i.) CO_2 emissions on account of power used by the project activity facilities in the year "y" **($PE_{y, power}$).** Emission factor for grid electricity or diesel fuel use as the case may be shall be calculated as described in category AMS I.D

(ii.) Methane emissions through inefficiency of the wastewater treatment and presence of degradable organic carbon in treated wastewater in the year "y" ***($PE_{y,ww,treated}$).***

(iii.) Methane emissions from the decay of the final sludge generated by the treatment systems in the year "y" ***($PE_{y,s\ final}$).***

(iv.) Methane fugitive emissions through inefficiencies in capture and flare systems in the year "y" (**PE y,fugitive.)**

(v.) Methane emissions resulting from dissolved methane in the treated wastewater effluent in the year "y" **(PEy, dissolved)**

$$\underset{(t\,CO_2e/year)}{PE_y} = \underset{(t\,CO_2e/year)}{PE_{y,power}} + \underset{(t\,CO_2e/year)}{PE_{y,ww,,treated}} + \underset{(t\,CO_2e/year)}{PE_{y,s\ final}} + \underset{(t\,CO_2e/year)}{PE_{y,fugitive}} + \underset{(t\,CO_2e/year)}{PE_{y,\ dissolved}}$$

(i) CO_2 emissions related to the power used by the equipment in the project activity **($PE_{y,power}$).**

These are the emissions due to electricity consumed by the installations in the project activity. These emissions are obtained by multiplying the electricity consumed in the year ($E_{consumed}$ MWh/ year) and the electricity baseline emission factor of the grid. (EF_y t CO_2/ MWh)

$PE_{y,power}$	=	$Ey_{, consumed}$	*	EF_y
(t CO_2e /year)		(MWh/year)		(tCO_2/MWh)

$E_{y\ consumed}$ - Power consumed /year

On an average, 1405 kWh /day (1.405 MWh/day) is consumed to operate the installations in the wastewater treatment plant. This average value is now considered for estimation of ex-ante emission calculations. Actual value would be used during monitoring for calculation of emission reductions.

$E_{y\ consumed}$	=	1.405	*	365
(MWh/year)		(MWh/day)		(No of days/year)
	=	**512.83 MWh/year**		

EF_y- Electricity baseline emission factor of the grid

AMS IIIH/ version 04 specifies to determine the electricity baseline emission factor of the grid as per AMS I.D.

The project activity is in Karnataka state in India which is part of southern regional grid. Hence, southern regional grid has been considered for electricity baseline emission factor.

Central Electricity Authority, (CEA) is the statutory organisation and its main objective is to advise the Government of India (Host Party) on the matters relating to the national electricity policy, formulate short-term and perspective plans for development of the electricity system and coordinate the activities of the planning agencies for the optimal utilization of resources to sub serve the interests of the national economy and to provide reliable and affordable electricity to all consumers. CEA has made an elaborate study and has determined electricity baseline emission factor for all grids in India for both the options of weighted average emissions and on combined margin approach which is as per AMS I.D. The latest emission factor of the southern regional grid would be considered for electricity baseline emission factor. The latest data is available for the year 2004-05 which is adopted. Since the emission factor is considered for estimation of project activity emissions, the highest value would be adopted for estimation of project activity emissions due to electricity consumed by the facilities.

The following table B.6 -1 gives various latest baseline emission factors for various approaches :

Table B.6.1- Baseline emission factor of southern regional grid for various approaches

Year	Approach	Value
2004-2005	Weighted average emissions **excluding** imports from other grids	0.79 t CO_2/ MWh
2004-2005	Weighted average emissions **including** imports from other grids	0.79 t CO_2/ MWh
2004-2005	Combined Margin method **excluding** imports from other grids	0.86 t CO_2/ MWh
2004-2005	Combined Margin method **including** imports from other grids	0.86 t CO_2/ MWh

Since the electricity baseline emission factor of the grid is applied to calculate the project activity emissions only, the higher value of table B.6.1 (0.86 t CO_2/ MWh) would be adopted.

(ii) Methane emissions through inefficiency of the wastewater treatment and presence of degradable organic carbon in treated wastewater ***($PE_{y,ww,treated}$).***

These emissions ($PE_{y, ww, treated}$) are due to the emissions of methane from the wastewater after leaving the anaerobic digesters as the wastewater will still have some chemical oxygen demand. But, in the closed anaerobic UASB reactors, all the anaerobically degradable carbon would have degraded and the wastewater leaving the anaerobic reactors would not practically degrade further. However, the emissions from this degradable carbon are calculated as a conservative estimate.

The UASB reactors have a COD removal efficiency of 70 – 75%. A removal efficiency of 70 % would be adopted for calculation of ex-ante calculations. Actual value shall be adopted during monitoring.

The project activity emissions due to COD in the wastewater leaving the digesters is calculated as per the following formula given in the approved methodology AMS III.H/Version 04;

$$PE_{y, ww, treated} = Q_{y, ww} * COD_{y, ww, treated} * B_{0, ww} * MCF_{ww, final} * GWP\_CH_4$$

Where $PE_{y, ww, treated}$ is the project emissions due to degradable organic carbon in the wastewater leaving the wastewater treatment in t CO_2 e/year in the year "y"

$Q_{y, ww}$ is the volume of wastewater treated in the year "y"

$COD_{y, ww, treated}$ is the chemical oxygen demand of the treated wastewater in the year"y" in "tonne/m^3)

$B_{0,\ ww}$ is the methane generation capacity of the treated wastewater (as per AMS III. H. / version 4 , IPCC default value of 0.21t CH_4/t COD is adopted)

$MCF_{ww,\ treated}$ is the methane conversion factor based on type of treatment and discharge pathway of the wastewater. (MCF higher value in table III.H.1. shall be adopted). The wastewater after the UASB reactors would flow to anaerobic deep lagoon (depth more than 2 metres). The MCF higher value as per Table III.H.1 for anaerobic deep lagoon is **1.0**

GWP_CH_4 Global Warming Potential for CH_4 (21 ton CO_2/ton CH_4)

(iii) Methane emissions from the decay of the final sludge generated by the treatment systems in the year "y" ***($PE_{y,s\ final}$).***

These are the emissions that arise from the anaerobic degradation of the final sludge produced by the treatment systems. In the project activity, the sludge produced by the treatment systems is very less. This sludge is basically the excess sludge in the UASB reactors which are removed from the UASB reactors periodically. In the project activity, this sludge would be mixed with pressmud and treated wastewater and subjected to aerobic composting. Since the sludge is processed through aerobic methods, the sludge would not degrade anaerobically and hence there would be no emissions.

(iv) Methane fugitive emissions through inefficiencies in capture and flare systems in the year "y" **($PE_{y,fugitive}$.)**

These are the emissions that would occur when biogas is combusted in flare and heating equipment.

$$PE_{y,fugitive} = PE_{y,fugitive,ww} + PE_{y,fugitive,\ s}$$

Where :

$PE_{y,fugitive,ww}$ is fugitive emissions through capture and flare inefficiencies in the anaerobic wastewater in the year, "y' (ton CO_2e) and

$PE_{y,fugitive,s}$ is fugitive emissions through capture and flare inefficiencies in the year, "y' and anaerobic sludge treatment (ton CO_2e). .

Since the sludge is not treated anaerobically, $PE_{y,\ fugitive,\ s}$ is not calculated

Hence, $\mathbf{PE_{y,fugitive} = PE_{y,fugitive,ww}}$

$$PE_{y,fugitive,ww} = (1-CFE_{ww}) * MEP_{y,\ ww,\ treatment} * GWP\_CH_4$$

Where, CFE_{ww} is capture and flare efficiency of methane recovery and combustion equipment. The methodology specifies a default value of 0.9. This default value would be used only when biogas is combusted in a flare. When biogas is combusted in the heating equipment where all the biogas would be burnt completely a default value of 0.99 (as per approved methodology AM0013 would be adopted)

$MEP_{y, ww, untreated}$ is methane emission potential of the untreated wastewater in the year "y" (tons)

GWP_CH_4 is Global Warming Potential for CH_4 (21 ton CO_2/ton CH_4)

$$\underset{(ton\ CH_4/year)}{MEP_{y,ww,treatment}} = \underset{(m^3/year)}{Q_{y,ww}} * \underset{(ton\ COD/m^3)}{COD_{y,ww,untreated}} * \underset{(ton\ CH_4/ton\ COD)}{B_{o,ww}} * MCF_{ww,treatment}$$

Where:

$Q_{y, ww}$ is the volume of wastewater treated in the year "y" in m^3/year

$COD_{y,ww, untreated}$ is chemical oxygen demand of the wastewater entering UASB in the year in tonnes/m^3

$B_{0, ww}$ is the methane generation capacity of the treated wastewater (as per AMS III. H. IPCC value of 0.21ton CH_4/ ton COD is adopted)

$MCF_{ww, treatment}$ is the methane correction factor for the wastewater treatment system that will be equipped with methane recovery and combustion (MCF higher values in table III.H.1.). The MCF higher value for anaerobic deep lagoon (depth more than 2 meters) **is 1.0**.

$$\underset{(ton\ CO_2\ e/year)}{PE_{y,fugitive}} = 0.1 * \underset{(m^3/year)}{Q_{y,ww}} * \underset{(ton\ COD/m^3)}{COD_{y,ww,untreated}} * \underset{(ton\ CH_4/ton\ COD)}{B_{o,ww}} * MCF_{ww,treatment} * \underset{(tonCO_2e/tCH_4)}{GWP\_CH_4}$$

<u>(v) Methane emissions resulting from dissolved methane in the treated wastewater effluent in the year "y"</u> **<u>(PEy, dissolved)</u>**

These are the methane emissions due to methane dissolved in the treated wastewater which are calculated by the formula as per AMS III.H/version 4:

$$\underset{(ton\ CO_2\ e/year)}{PE_{y,dissolved}} = \underset{(m^3/year)}{Q_{y,ww}} * \underset{(tonnes/m^3)}{[CH_4]_{y,ww,treated}} * \underset{(ton\ CO_2\ e/ton\ CH_4)}{GWP\_CH_4}$$

Where,

$Q_{y, ww}$ is the volume of wastewater treated in the year "y"

$[CH_4]_{y, ww, treated}$ is the dissolved methane content in the treated wastewater . As per methodology, default value of 10 e-4 tonnes/ m^3 would be adopted for estimation of ex-ante calculations.

<u>Leakage</u>

As per approved methodology AMS III.H/ version 4, the leakage is to be considered if the used technology is equipment is transferred from another project activity or if the existing equipment is transferred to another activity. Since this is not case in the project activity, no leakage is considered for the project activity.

Therefore, Emissions reductions (ER_y) = Baseline emissions (BE_y)- Project emissions (PE_y)

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	**$Q_{y, ww,}$**
Data unit:	m^3/ year
Description:	Amount of wastewater entering the wastewater treatment plant (anaerobic lagoons in the baseline scenario and into the digesters in the project scenario)
Source of data used:	Operating records
Value applied:	148,500 m^3/year.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is required to calculate the organic load to the wastewater treatment plant. This is based on the average value of wastewater treated per day multiplied by the number of operating days.
Any comment:	During monitoring this value shall be measured on a continuous basis and would be used for estimation of project activity emissions.

Data / Parameter:	**$COD_{y, ww, untreated}$**
Data unit:	ton/m^3
Description:	Chemical Oxygen Demand of the untreated wastewater
Source of data used:	Maintenance Records
Value applied:	0.145
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is a key data for estimation of ex-ante baseline emissions and post monitoring project activity emissions. Data is measured by internationally accepted standards.
Any comment:	Average value of COD is assumed for estimation of ex-ante emission estimates. Actual values would be used during monitoring for estimation of project activity emissions.

Data / Parameter:	**$B_{o, ww}$**
Data unit:	ton CH_4/ ton CO_2
Description:	Methane producing capacity of the wastewater
Source of data used:	IPCC default value and AMS III H/version 4
Value applied:	0.21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is required to estimate ex-ante baseline emissions and project activity emissions during monitoring.
Any comment:	IPCC default value is 0.25. AMS III.H/Version 04 specifies to use lower value of 0.21 to account for uncertainties.

Data / Parameter:	**$MCF_{ww, treatment}$**
Data unit:	Fraction
Description:	Methane correction factor
Source of data used:	Default values from Chapter 6 of Volume 5, Waste, IPCC 2006 guidelines and AMS III H/version 4
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	Required to estimate ex-ante baseline emissions.
Any comment:	Lower value of Table III.H.1. in AMS III.H./version 4 for anaerobic deep lagoon (depth more than 2 metres)

Data / Parameter:	**GWP_CH_4**
Data unit:	ton CO_2 e / ton CH_4
Description:	Global Warming Potential of methane
Source of data used:	IPCC default value
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is required to estimate all emission calculations
Any comment:	If there is any revision in IPCC default value of GWP_CH_4 , same would be adopted.

Data / Parameter:	**$E_{y, consumed}$**
Data unit:	MWh/year
Description:	Electricity consumed per year
Source of data used:	Based on calculations of the power installed in the wastewater treatment plant
Value applied:	512. 825
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is required to estimate project activity emissions due to electricity consumed by the by the facilities in the wastewater treatment. It is calculated based on the installed capacity of the facilities and average electricity consumed.
Any comment:	Actual electricity consumed by the facilities will be measured and would be adopted for calculation of project activity emissions.

Data / Parameter:	**EF_y**
Data unit:	ton CO_2/ MWh
Description:	Electricity baseline emission factor of the grid
Source of data used:	Website of Central Electricity Authority. www.cea.nic.in
Value applied:	0.86
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is required to estimate project activity emissions due to electricity consumed by the by the facilities in the wastewater treatment. The latest official baseline emission factor of the southern regional grid .
Any comment:	-
Data / Parameter:	**$COD_{y, ww, treated}$**
Data unit:	ton/m^3
Description:	Chemical Oxygen Demand of the treated wastewater leaving the digesters
Source of data used:	Maintenance Records
Value applied:	0.0435
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is a key data for estimation of ex-ante and post monitoring project activity emissions. Data is measured by internationally accepted standards.
Any comment:	Average value of COD is assumed for estimation of ex-ante estimates. Actual values would be used during monitoring for estimation of project activity emissions.

Data / Parameter:	**$MCF_{ww, final}$ / $MCF_{ww, treatment}$**
Data unit:	Fraction
Description:	Methane correction factor
Source of data used:	Default values from Chapter 6 of Volume 5, Waste, IPCC 2006 guidelines and AMS III H/version 4
Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Required to estimate ex-ante project activity emissions.
Any comment:	Higher value of Table III.H.1. in AMS III.H./version 4 for anaerobic deep lagoon (depth more than 2 metres)

Data / Parameter:	**$CH_{4, y, ww, treated}$**
Data unit:	Tons/ m^3
Description:	Dissolved methane in wastewater
Source of data used:	Default value as per AMS III.H/version 4
Value applied:	10e-4
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is applied to estimate methane dissolved in wastewater leaving the treatment plant
Any comment:	-

Data / Parameter:	**Depth**
Data unit:	m
Description:	Depth of existing lagoons
Source of data used:	Actual measurement at site
Value applied:	More than 2 metres
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is applied to estimate ex-ante baseline and project emissions
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

6.3.1 Emission Reductions

The emission reduction of the project activity is the difference between the baseline emissions and the sum of the project emissions.

$$ER_y = BE_y - PE_y$$

Where ER_y is the emission reductions of the project activity for the year "y"(tCO_2 e)

BE_y is the baseline emissions in the year "y" (tCO_2e)

PE_y is the project activity emissions in the year, "y' (tCO_2 e)

6.3.2 Baseline emissions - BE_y

The baseline emissions is calculated by using the formula given in section 7 (d) of AMS III .H/Version 04 which is given below :

$$BE_y = Q_{y, ww,} * COD_{y, ww, untreated} * B_{o, ww,} * MCF_{ww, treatment} * GWP\_CH_4$$

Where BE_y is baseline emissions in the year "y" (tCO_2e)

$Q_{y, ww}$ is volume of wastewater treated in the year "y" (m^3/year).

$COD_{y, ww, untreated}$ is chemical oxygen demand of the wastewater entering the anaerobic reactor in the year, "y" (tonnes/m^3)

$B_{o, ww}$ is the methane producing capacity of the wastewater (ton CH_4/ton COD)

$MCF_{ww, treatment}$ is the methane correction factor for the existing wastewater treatment system to which the sequential anaerobic treatment step is being introduced (MCF lower value in Table III.H.1)

GWP_CH_4 is the Global Warming Potential of methane (21 ton CO_2/ ton CH_4)

$Q_{y, ww}$ (m^3/year)	=	Volume /day (m^3/day)	*	Number of days of operation (days/year)

Volume /day : The maximum volume of wastewater that is generated in the distillery is 500 m^3/day and the minimum volume of wastewater is 400 m^3/day. Hence, an average value of 450 m^3/day would be adopted for estimation of ex-ante emission calculations.

Number of days of operation is 330 days per year.

Adopting the values,

$$Q_{y, ww} = 450 * 330$$

(m^3/year) (m^3/day) (days/year

= 148,500 m^3/year

$COD_{y, ww, untreated}$: The average value of COD of the wastewater entering the lagoons in the baseline scenario and into the anaerobic digester in the project scenario is 145 kg /m^3 (0.145 tons/ m^3

Adopting other values as given in Section B.6.1,

BE_y **(tCO_2e/year)**	=	148,500 (m^3/year)	*	0.145 (ton/m^3)	*	0.21 (ton CH_4/ ton CO_2)	*	0.8	*	21 (ton CO_2/ ton CH_4)
	=	**75,966.66 ton CO_2e / year**								
	=	**75, 967 ton CO_2 e/year**								

6.3.3. Project Activity Emissions

PE_y = $PE_{y,power}$+ $PE_{y,ww,,treated}$+ $PE_{y,s\ final}$+ $PE_{y,fugitive}$+ $PE_{y, dissolved}$

Where,

PE_y is the project activity emissions in the year, "y", tonnes /m^3

$PE_{y, power}$ is the CO_2 emissions due to electricity used by the project activity facilities in the year "y"

$PE_{y, ww, treated}$ is the methane emissions through inefficiency of the wastewater treatment and presence of degradable organic carbon in treated wastewater in the year "y"

$PE_{y,s\ final}$ is the methane emissions from the decay of the final sludge generated by the treatment systems in the year "y"

$PE_{y, fugitive}$ is the methane fugitive emissions through inefficiencies in capture and flare systems in the year "y"

$PE_{y, dissolved}$ is the methane emissions resulting from dissolved methane in the treated wastewater effluent in the year "y"

6.3.3.1 $PE_{y, power}$ - CO_2 emissions due to electricity used by the project activity facilities in the year "y"

$PE_{y,power}$ (t CO_2/year)	=	$E_{y, consumed}$ (MWh/year)	*	EF_y (tCO_2/MWh)

Adopting the values mentioned in B.6.1,

$PE_{y, power}$ (t CO_2/year)	=	512.825* (MWh/year)	0.86 (tCO_2/MWh)
	=	**441.03 t CO_2/ year**	
	=	**441 t CO_2 /year**	

6.3.3.2 $PE_{y, ww, treated}$ is the methane emissions through inefficiency of the wastewater treatment and presence of degradable organic carbon in treated wastewater in the year "y"

$PE_{y, ww, treated} = Q_{y, ww} * COD_{y, ww, treated} * B_{0, ww} * MCF_{ww, final} * GWP\_CH_4$

$PE_{y, ww, treated}$ is the project emissions due to degradable organic carbon in the wastewater leaving the wastewater treatment in t CO_2/year in the year "y"

$Q_{y, ww}$ is the volume of wastewater treated in the year "y" (148,500 m^3/year)

$COD_{y, ww, treated}$ is the chemical oxygen demand of the treated wastewater in the year"y"("tonne/m^3) . The UASB reactors have a COD removal efficiency of 70 – 75%. A removal efficiency of 70 % would be adopted for calculation of ex-ante calculations. The average inlet COD to the treatment plant is 0.145 ton COD /m^3. Considering 70 % COD removal in UASB reactors, the COD of the wastewater leaving the UASB reactors is 0.0435 ton /m^3.

$B_{0, ww}$ is the methane generation capacity of the treated wastewater (as per AMS III. H./ version 4 , IPCC default value of 0.21t CH_4/t COD is adopted)

$MCF_{ww, treated}$ is the methane conversion factor based on type of treatment and discharge pathway of the wastewater. (MCF higher value in table III.H.1. shall be adopted). The wastewater after the UASB reactors would flow to anaerobic deep lagoon (depth more than 2 metres). The MCF higher value as per Table III.H.1 for anaerobic deep lagoon is **1.0**

GWP_CH_4 Global Warming Potential for CH_4 (21 ton CO_2/ton CH_4)

Adopting the above values in the formula,

$PE_{y, ww, treated}$ **(tCO_2e/year)**	=	148,500 (m^3/year)	*	0.0435 (ton/m^3)	*	0.21 (t CH_4/ t CO_2)	*	1.0	* 21 (t CO_2/ t CH_4)
	=	**28,487 t CO_2/year**							

6.2.3.3. $PE_{y,s\ final}$ is the methane emissions from the decay of the final sludge generated by the treatment systems in the year "y"

Since the final sludge generated by the treatment systems are not treated anaerobically, this is not applicable and hence $PE_{y, s, final}$ is zero.

6.2.3.4 $PE_{y,\ fugitive}$ is the methane fugitive emissions through inefficiencies in capture and flare systems in the year "y"

$PE_{y,\ fugitive}$ = 0.1 * $Q_{y,ww}$ * $COD_{y,ww,\ untreated}$ * $B_{o,\ ww}$ * $MCF_{ww,\ treatment}$ * GWP_CH_4

(ton CO_2e/year) (m^3/year) (ton COD/m^3) (ton CH_4/ton COD) (tonCO_2e/tCH_4)

$Q_{y,\ ww}$ is the volume of wastewater treated in the year "y" (148,500 m^3/year)

$COD_{y,ww,\ untreated}$ is chemical oxygen demand of the wastewater entering UASB (0.145 tonnes/m^3)

$B_{0,\ ww}$ is the methane generation capacity of the treated wastewater (as per AMSIII.H/version 4, IPCC value of 0.21ton CH_4/ ton COD is adopted)

$MCF_{ww,\ treatment}$ is the methane correction factor for the wastewater treatment system that will be equipped with methane recovery and combustion (MCF higher values in table III.H.1.). The MCF higher value for anaerobic deep lagoon (depth more than 2 meters) **is 1.0**.

GWP_CH_4 is the Global Warming Potential of methane (21 t CO_2 e/ t CH_4).

Adopting the values in the formula,

$PE_{y,\ fugitive}$ = 0.1 * 148,500 * 0.145 * 0.21 * 1.0 * 21
(ton CO_2e/year) (m^3/year) (ton COD/m^3) (ton CH_4/ton COD) (tonCO_2/tCH_4)

= 9495.82 t CO_2 / year

= **9496 ton CO_2e/ year**

6.2.3.5. Methane emissions resulting from dissolved methane in the treated wastewater effluent in the year "y" **(PEy, dissolved)**

$PE_{y,\ dissolved}$ = $Q_{y,\ ww}$ * $[CH_4]_{y,\ ww,\ treated}$ * GWP_CH_4

Where,

$Q_{y,\ ww}$ is the volume of wastewater treated in the year "y" (148,500 m^3/ year)

$[CH_4]_{y,\ ww,\ treated}$ is the dissolved methane content in the treated wastewater . As per methodology, default value of 10 e-4 tonnes/ m^3 would be adopted for estimation of ex-ante calculations

GWP_CH_4 is the Global Warming Potential of methane (21 t CO_2/ t CH_4)

Adopting the values in the formula,

$PE_{y,\ dissolved}$ = 148,500* 10e-4 * 21
(ton CO_2/year) (m^3/year) (tons/m^3) (ton CO_2e/ton CH_4)

= 3118.5 ton CO_2/year

= **3119 ton CO_2/year**

Hence, total project activity emissions, PE_y

PE_y = $PE_{y,power}$ + $PE_{y,ww,,treated}$ + $PE_{y,s\ final}$ + $PE_{y,fugitive}$ + $PE_{y,\ dissolved}$

($t\ CO_2$/year) ($t\ CO_2$/year) ($t\ CO_2$/year) ($t\ CO_2$/year) ($t\ CO_2$/year) ($t\ CO_2$/year)

= 441 + 28,487 + 0 + 9496 + 3119

= **41,543 ton CO_2 e/ year**

Excel spreadsheet giving the above calculations is attached as Appendix 2.

B.6.4 Summary of the ex-ante estimation of emission reductions:

The estimated baseline emissions, project emissions and the emission reductions of the project activity are tabulated in the table B. 6.2 below:

Table B.6.2 – Ex –ante estimation of emission reductions

S.No.	**Year**	**Baseline emissions (ton CO_2e)**	**Project emissions (ton CO_2e)**	**Emission reductions (ton CO_2e)**
1	2007- 2008	75,967	41,543	34,424
2	2008-2009	75,967	41,543	34,424
3	2009-2010	75,967	41,543	34,424
4	2010-2011	75,967	41,543	34,424
5	2011-2012	75,967	41,543	34,424
6	2012-2013	75,967	41,543	34,424
7	2013-2014	75,967	41,543	34,424
8	2014-2105	75,967	41,543	34,424
9	2015-2016	75,967	41,543	34,424
10	2016-2017	75,967	41,543	34,424
Total(2007-2017)		**759,670**	**415,430**	**344,240**

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:
(Copy this table for each data and parameter)

Data / Parameter:	**$Q_{y, ww,}$**
Data unit:	m^3
Description:	Volume of wastewater entering the wastewater treatment plant
Source of data to be used:	Actual measurements
Value of data	Value of data would be used to calculate project emissions
Description of measurement methods and procedures to be applied:	Flow meter would be used to measure the volume of wastewater entering the treatment plant and readings would be recoded and archived electronically for the entire crediting period and two years thereafter.
QA/QC procedures to be applied:	Flow meters would be calibrated as per manufacturer's prescribed standards.
Any comment:	

Data / Parameter:	**$COD_{y, ww, untreated}$**
Data unit:	ton/m^3
Description:	Chemical Oxygen Demand of the untreated wastewater
Source of data to be used:	Actual measurements in the in-house lab.
Value of data	Value of data would be used to calculate project emissions
Description of measurement methods and procedures to be applied:	COD would be analysed in the in-house lab by internationally accepted standards and archived electronically for the entire crediting period and two years thereafter. Average monthly values would be adopted for estimation of emissions.
QA/QC procedures to be applied:	COD of the untreated wastewater would be analysed in external accredited laboratories once in 3 months.
Any comment:	-

Data / Parameter:	**$COD_{y, ww, treated}$**
Data unit:	ton/m^3
Description:	Chemical Oxygen Demand of the wastewater leaving the digesters/ entering lagoons
Source of data to be used:	Actual measurements in the in-house lab.
Value of data	Value of data would be used to calculate project emissions
Description of measurement methods	COD would be analysed in the in-house lab by internationally accepted standards and archived electronically for the entire crediting period and two years

and procedures to be applied:	thereafter. Average monthly values would be adopted for estimation of emissions.
QA/QC procedures to be applied:	COD of the untreated wastewater would be analysed in external accredited laboratories once in 3 months.
Any comment:	

Data / Parameter:	**GWP_CH_4**
Data unit:	ton CO_2 e / ton CH_4
Description:	Global Warming Potential of methane
Source of data to be used:	IPCC default value
Value of data	21
Description of measurement methods and procedures to be applied:	Data is required to estimate all emission calculations
QA/QC procedures to be applied:	
Any comment:	If there is any revision in IPCC default value of GWP_CH_4 , same would be adopted.

Data / Parameter:	**$E_{y, consumed}$**
Data unit:	MWh/day
Description:	Electricity consumed per day
Source of data to be used:	Actual measurements
Value of data	Data is required to estimate project activity emissions for estimating emissions due to electricity consumed by the facilities in the wastewater treatment plant.
Description of measurement methods and procedures to be applied:	Monthly electricity consumption data of the installations in the wastewater treatment plant shall be recorded.
QA/QC procedures to be applied:	Electricity meters would be calibrated as per standards.
Any comment:	-

Data / Parameter:	**EF_y**
Data unit:	ton CO_2/ MWh
Description:	Electricity baseline emission factor of the grid
Source of data to be used:	Website of Central Electricity Authority. www.cea.nic.in
Value of data	Data is required to estimate project activity emissions due to electricity consumed by the by the facilities in the wastewater treatment.

Description of measurement methods and procedures to be applied:	Not applicable
QA/QC procedures to be applied:	Not applicable
Any comment:	

Data / Parameter:	**$MCF_{ww, final}$ / $MCF_{ww, treatment}$**
Data unit:	Fraction
Description:	Methane correction factor
Source of data to be used:	Default values from Chapter 6 of Volume 5, Waste, IPCC 2006 guidelines and Table III.H.1 of AMS III H/version 4
Value of data	1.0
Description of measurement methods and procedures to be applied:	Required to estimate ex-ante project activity emissions.
QA/QC procedures to be applied:	-
Any comment:	Higher value of Table III.H.1. in AMS III.H./version 4 for anaerobic deep lagoon (depth more than 2 metres)

Data / Parameter:	**$CH_{4, y, ww, treated}$**
Data unit:	Tons/ m^3
Description:	Dissolved methane in wastewater leaving the reactors
Source of data to be used:	Default value as per AMS III.H/version 4
Value of data	10e-4
Description of measurement methods and procedures to be applied:	Data is applied to estimate methane dissolved in wastewater leaving the treatment plant
QA/QC procedures to be applied:	Default value as per methodology
Any comment:	If default value is amended subsequently, same would be adopted.

Data / Parameter:	**$Q_{y, biogas}$**
Data unit:	m^3
Description:	Volume of biogas generated
Source of data to be used:	Actual measurements
Value of data	-
Description of measurement methods	The data would be measured by continuous flow meters and recorded. The data would be electronically archived for the entire crediting period and two years

and procedures to be applied:	thereafter.
QA/QC procedures to be applied:	Flow meters would be calibrated as per manufacturer's recommendations.
Any comment:	-

Data / Parameter:	**C_{CH4}**
Data unit:	%
Description:	Methane content in the biogas
Source of data to be used:	Actual measurements
Value of data	Data would be used to estimate methane content in the biogas generated and the baseline emissions
Description of measurement methods and procedures to be applied:	The methane content of the biogas would be measured once in a month by internationally accepted methods. Average value would be used for estimation of methane content and baseline emissions. The data would be electronically archived for the entire crediting period and two years.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**P_{CH4}**
Data unit:	kg /cm^2
Description:	Pressure of the biogas
Source of data to be used:	Actual measurements
Value of data	Data would be used to estimate density of the biogas to calculate the baseline emissions
Description of measurement methods and procedures to be applied:	The pressure of the biogas would be measured and recorded. Average value would be used for estimation of density of methane and baseline emissions. The data would be electronically archived for the entire crediting period and two years thereafter.
QA/QC procedures to be applied:	The instrument would be maintained as per as per manufacturer's recommendations.
Any comment:	-

Data / Parameter:	**T_{CH4}**
Data unit:	^{0} C
Description:	Temperature of the biogas
Source of data to be used:	Actual measurement
Value of data	Data would be used to estimate density of the biogas to calculate the baseline emissions
Description of measurement methods	The temperature of the biogas would be measured and recorded. Average value would be used for estimation of density of methane and baseline emissions. The

and procedures to be applied:	data would be electronically archived for the entire crediting period and two years thereafter.
QA/QC procedures to be applied:	The instrument would be maintained as per as per manufacturer's recommendations.
Any comment:	-

Data / Parameter:	**D_{CH4}**
Data unit:	Tons/ m^3
Description:	Density of methane
Source of data to be used:	Calculated based on temperature and pressure of biogas.
Value of data	Data would be used to estimate to calculate the baseline emissions.
Description of measurement methods and procedures to be applied:	The data would be electronically archived for the entire crediting period and two years thereafter.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**H_{flare}**
Data unit:	Hours
Description:	Number of hours of operation of flare
Source of data to be used:	Measured and Recorded
Value of data	Data would be used to estimate project emissions due to emissions of flare inefficiency.
Description of measurement methods and procedures to be applied:	The number of hours of operation of flare would be recorded and electronically archived for the entire crediting period and two years thereafter.
QA/QC procedures to be applied:	-

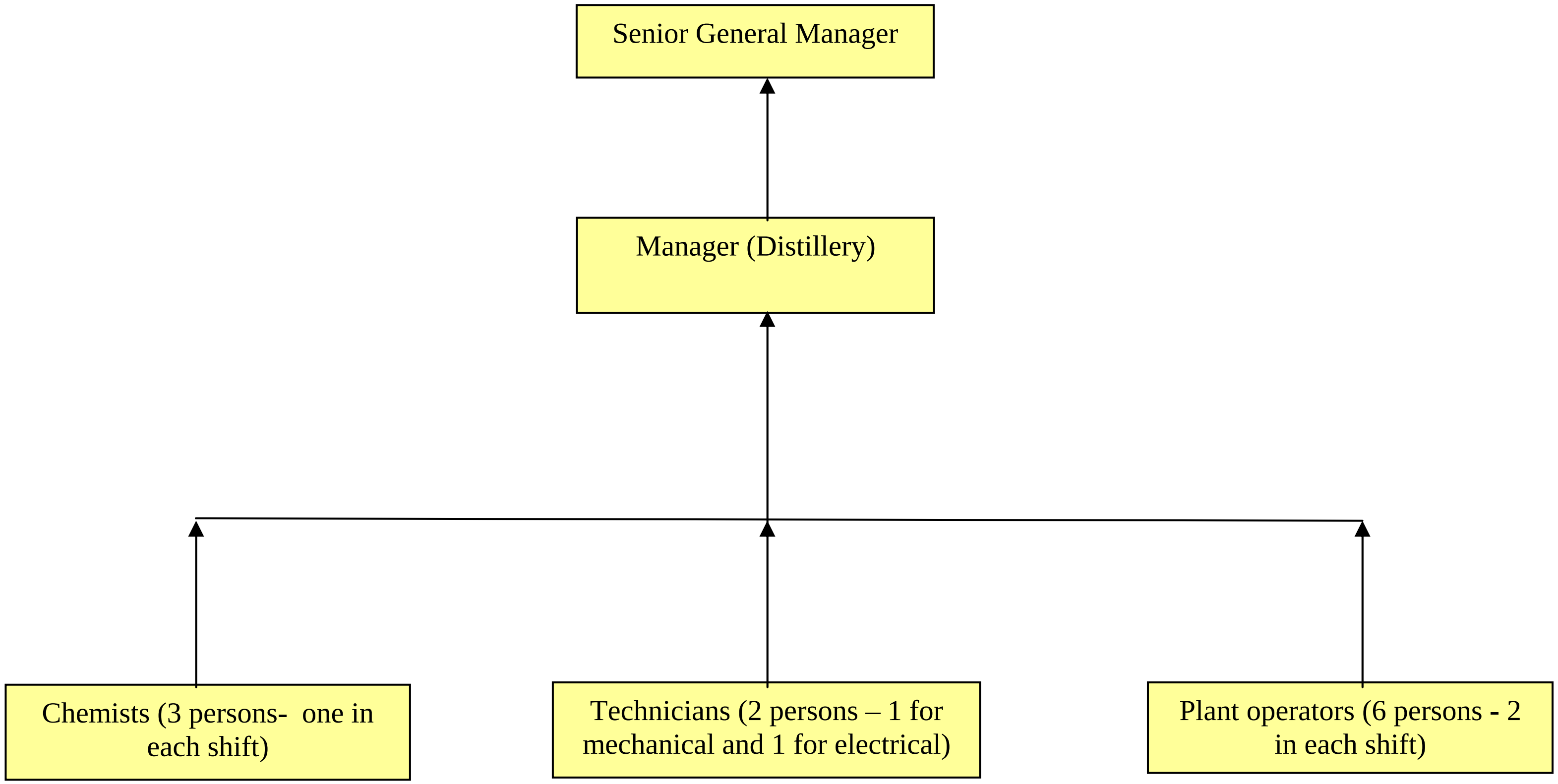
Data / Parameter:	**$S_{y,\ generated}$**
Data unit:	tonnes
Description:	Quantity of final sludge from UASB reactors
Source of data to be used:	Actual measurement
Value of data	Monitored to neglect the emissions due to decay of this sludge
Description of measurement methods and procedures to be applied:	Weight of final sludge would be determined.
QA/QC procedures to	-

be applied:	
Any comment:	-

Data / Parameter:	$\mathbf{S_{y,\ composted}}$
Data unit:	tonnes
Description:	Quantity of final sludge from UASB reactors sent to compost yard
Source of data to be used:	Actual measurement
Value of data	Monitored to neglect the emissions due to decay of this sludge
Description of measurement methods and procedures to be applied:	Weight of sludge would be determined before dumped to compost yard.
QA/QC procedures to be applied:	-
Any comment:	-

B.7.2 Description of the monitoring plan:

The project activity is located in the premises of sugar mill and distillery complex. Senior General Manager is the overall head of operations of the complex. The Senior General Manager is in charge of operations of the wastewater treatment plant including methane recovery system and other facilities in the wastewater treatment plant.


Senior General Manager
Manager (Distillery)
Chemists (3 persons- one in each shift)
Technicians (2 persons – 1 for mechanical and 1 for electrical)
Plant operators (6 persons - 2 in each shift)

The organization structure illustrated shall be in charge of the operation and maintenance of the wastewater treatment plant.

<u>Training of personnel</u>

UEPL, the technology provider for the methane recovery system, has trained the personnel of SCSL in operation, trouble shooting and maintenance of the methane recovery system . UEPL's personnel were at site for one year from the date of commissioning the plant. During this period SCSL 's personnel were trained in operation, maintenance, trouble shooting, analysis of operating parameters, measuring COD, analysis of biogas and other safety measures of the anaerobic digestion plant

The plant operators run the plant on a day today basis and are assisted by two technicians for maintenance of mechanical and electrical installations in the plant. A chemist with graduate/postgraduate qualification in chemistry would be available in each shift for analysis of all operating parameters like COD, biogas, etc,

The technicians will be responsible for maintenance of equipment and installations in the anaerobic digestion plant. Any break down shall be recorded with details like type of break down, trouble shooting done, etc., and verified by the Manager (Distillery).

<u>Data monitoring</u>

Records shall be maintained for quantity of waste water entering the digesters/day, its COD, gas flowing to heating equipment, gas to flare etc., All these records shall be verified by Manager (Distillery) and after verification and approval shall be maintained in electronic form as per monitoring methodology. The records shall be maintained in office cum laboratory of the anaerobic digestion plant. A back up shall be created in electronic form for all the records and maintained for two years after last issuance of CERs. The monitoring parameters like COD of wastewater entering digesters, COD of wastewater leaving the digesters, flow of wastewater entering digesters, methane content of biogas etc., shall be measured and recorded by the chemists. These parameters shall be checked by Manager (Distillery). After approval by the Manager (Distillery), these values shall be maintained in electronic form till two years after the last issuance of CERs.

<u>QA/QC procedures</u>

All instruments like wastewater flow meter, gas flowmeter, temperature and pressure measuring instruments, Gas analyser shall be calibrated as per manufacturers' recommendations. The flowmeters shall be calibrated as per international/ manufacturers' recommendations

Internal Audits

All reported results and measurements shall be periodically reviewed by Senior General Manager and any discrepancy shall be corrected with authorization from Senior General Manager.

Emergency

The project activity does not have any operation that would not result emergency emissions. Hence, there is no data monitored for emergency preparedness.

UEPL shall train the SCSL staff in all emergency requirements. The staff shall be trained in operation and maintenance of fire fighting equipments like fire extinguishers. The emergencies can be leakage of biogas from gas holders, other gas handling equipment like gas cleaning system, gas blowers. Although all the equipment, piping and instrumentation are as per explosion proof and gas tight, emergencies can happen. The staff shall be trained to feel such leakages and immediately rectify the leakage areas.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of completion of application of the baseline and monitoring methodology : 12/01/2007.

Name of the responsible person : Subramanaian Nataraj
C/o. Ecoinvest Carbon S.A.
13, Rte de Florissant,
Geneva
Switzerland.
Tel : +41 22 592-9121
e-mail : subramanian.nataraj@bunge.com

This person is not a project participant as listed in Annex1.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/06/2005

C.1.2. Expected operational lifetime of the project activity:

25y-0m

C.2 Choice of the crediting period and related information:

The project will use **Fixed** Crediting period.

C.2.1. Renewable crediting period

Not Applicable

C.2.1.1. Starting date of the first crediting period:

Not Applicable

C.2.1.2. Length of the first crediting period:

Not Applicable

C.2.2. Fixed crediting period:

Yes.

C.2.2.1. Starting date:

Date of registration of the project activity would be the starting date of the crediting period.

C.2.2.2. Length:

10y-0m

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Article 12 of the Kyoto Protocol requires that a CDM project activity contribute to the sustainable development of the host country. Therefore, analyzing the impacts of the project activity on the environment and on the local community is important for the project.

The wastewater arising out of the operations, known as spentwash , contains high organic concentrations which are generally measured in terms of chemical oxygen demand (COD) and biological oxygen demand (BOD). In order to bring down the organic concentration of the wastewater as per environmental regulations, SCSL had constructed open anaerobic lagoons for reduction of COD and BOD. After treatment in lagoons, wastewater was mixed with pressmud from sugar mills and aerobically composted to produce organic compost. Subsequently realizing the damage to the environment due to anaerobic lagoons, although, there was no statutory requirement, SCSL had decided to set up an anaerobic digestion plant to treat the wastewater anaerobically and capture biogas and utilize the biogas fuel. The project activity is located within the premises of the distillery of SCSL.

The main objective of the project activity is to treat the distillery wastewater in anaerobic digesters, produce biogas and consume the biogas as fuel. This activity thus avoids release of methane, a potential greenhouse gas (GHG) with a global warming potential of 21 to atmosphere. Thus the project activity assists in reduction of greenhouse gases. SCSL had implemented the project with no drive from environmental regulations. No separate environmental impact assessment studies were done as not required by local environmental regulations.
However, an analysis of environmental impacts associated with the project activity is discussed below during construction and during operation phase

<u>During construction phase</u>
During construction phase the project because of its size did not have any negative impact on the local environment or local community. Although there were few impacts on environment due to movement of men and materials for construction, these impacts were negligible and do not have any significant impact on the environment.

However, the project activity had several positive impacts on the local community during construction, which are briefly mentioned below:

Several skilled and unskilled workers got employment opportunities during construction of the project activity. Procurement of construction materials, erection materials improved local economy. The special leak and explosion proof construction gave exposure to SCSL employees in such types of construction.

During operation phase

Impact on Air

The impacts on air is due to the emissions of burning biogas in boiler. All the methane in the biogas is expected to burn as boiler is a big capacity boiler for burning bagasse. Biogas, is largely a "clean fuel", and when burnt does not give much hazardous emissions. The other major constituent of the biogas apart from methane is carbon dioxide, which is of biogenic in nature. However the exhaust gases from the boilers are vented off into atmosphere through a 20 meter high stack to reduce the ground level concentration of exhausts. There are no other negative impacts on air due to the project activity. However there are few positive impacts on air due to the project activity.

The most important positive impact obviously is the reduction of release of greenhouse gas to the atmosphere. Earlier the wastewater was treated in open anaerobic lagoons and now due to the project, is treated in closed digesters leading to the capture of methane and utilizing it as fuel, has positive impacts on air quality of the environment.

Impact on water

The effluent leaving the anaerobic digesters after digestion is collected in a tank from where it is transported to lagoons and mixed with pressmud, a waste slurry from sugar mill and aerobically composted to produce organic compost. Since no wastewater is discharged on land or any water course, there is no impact on water due to the project activity.

Impact on odour

In the open lagoon treatment system, bad odours were produced due to anaerobic degradation of high COD strength wastewater in open lagoons. The production of these bad odours is completely reduced as majority of treatment takes place in closed reactors and the odour producing gases are captured and consumed. Hence, the project has immense positive impact on the environment and local community in reduction of bad odours.

Impact due to noise

There are no major noise producing equipment in the digestion plant but for centrifugal pumps and blowers. Moreover these equipment are inside the industry. Hence, there are no significant impacts on the environment due to noise.

Impact on ecology

There are no endangered species in the vicinity of the project and SCSL is located in a normal village setting with no fragile or sensitive ecology nearby. The project is located within the industry premises and no significant impact is effected on the ecology.

Social and economy issues

The location of sugar mill, distillery and the project has given immense job opportunities to the local community during construction and operation of the sugar mill, distillery and the project activity. KM Doddi village has sprung into the industrial map of Karnataka due to SCSL and local community had benefited extensively from the industries. Several restaurants, establishments and other small businesses have been set up in the vicinity and hence, the economy of the local community has improved, thereby improving the standard of living of the local community with access to better transportation, education , medical and other basic amenities.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

There are no significant impacts on the environment, ecology and local community due to the project activity. The project has only positive impacts on the environment.

The nature of the project does not warrant an environment impact assessment study due to the project activity and no regulatory mechanism requires same. The project is itself an environment friendly project with no drive from regulatory requirements. No environment impact assessment study was required as per statutory requirements and the industry has consent to operate the plants from Karnataka state pollution control board (KSPCB) and has been regularly renewing the annual consents.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

The local stakeholders of the project are the following :

i) Local community

ii) Local government authority

A meeting of local stakeholders was organised as part of CDM project activity and invitations were sent to residents of villages around the project activity, panchayats of these villages (government authority for these villages), Karnataka Power Transmission Company Ltd (KPTCL). The meeting was organised on 17.10.2005 and was well attended by representatives from the villages, representatives from village administration, KPTCL and educational institute.

E.2. Summary of the comments received:

Following representatives attended the meeting:

1. Mr. D Rajanna - Representative from Annur panchayat
2. Mr. G S Sidhagowda - Representative from Annur panchayat
3. Mrs. Savitha - Representative from Bharathinagara panchayat
4. Mr. Venkatagowda - Resident of Bharathinagara panchayat
5. Mr. Chikkavenkatagowda - Resident of Bharathinagara panchayat
6. Mr. M. D. Thesaprakash - Representative of KPTCL/CESCOM
7. Mrs. Veena - Principal, Cham Sugar School.
8. Mr. NN Prithiviraj - Senior General Manager, SCSL.
9. Mr. R Manii - Manager – Distillery, SCSL
10. Mr. Mohanan - Asst Manager (Esst), SCSL.
11. Mr. Kamalakannan - Admn Officer II, SCSL

The questions and answers during the meeting are given below :

Mr. N N Prithiviraj - Senior General Manager welcomed the gathering and explained about the purpose of the meeting. He briefly mentioned about the background of the company, its operations, installations and proposed expansions. He also explained about the Emission Reductions initiatives taken by **UNFCCC** and how Sri Chamundeswari Sugars Ltd, is taking of this **CDM** project to make it a successful installation.

He also informed that as part of CDM project, a local stakeholder meeting has to be conducted, to document the views and comments of local stakeholders of the project activity.

The queries raised by the local stakeholder and answers by the project proponent are given below;

Mrs. Veena asked in what way the project activity contributes for emission reductions?

Senior General Manager explained in details how the spentwash stored in lagoons for a prolonged time results in release of methane in to atmosphere. Presently by using modern technology we are extracting methane in closed condition by using the appropriate technology. The methane generated is used in boiler thus by avoiding emission to the atmosphere. The steam is produced from boiler by the methane generated is utilized for production of steam and power.

Mr. G S Sidhagowda asked in what way the project activity should increase the job opportunities for local population

Senior General Manager explained pointed out that already local people have been employed as much as possible and we assure you that in expansion, the local people would be considered for employment as much as possible in future also.

Mrs. Savitha representative of gram panchayat asked to what extend the project promoters should give a fixed annual income to the gram panchayat.

There is no sellable commodity produced in this project. However requirement of biomass fuel will be reduced to the extent of gas produced the value of savings will be intimated.

Mr. D Rajanna requested to repair the damaged roads in and around the villages and requested SCSL management to help in improving the roads.

Senior General Manager listed out the road work done by company and further assured to do the needful after consulting.

Mr. M. D. Thesaprakash KPTCL/CESCOM requested the SCSL to comply with all safety aspects, preventive, periodical maintenance and to comply with all requirements as per CDM.
Senior General Manager agreed for the same and explained the personal protective equipment being used by the employees and other safety procedures followed in the project activity.

Meeting ended with thanks to all present by **Mr. Mohanan Asst. Manager (Esst)** SCSL.

E.3. Report on how due account was taken of any comments received:

There was no comment requiring specific action from the project proponents.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Sri Chamundeswari Sugars Ltd
Street/P.O.Box:	76, Ulsoor Road
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E-Mail:	ho.projects@chamundisugars.com
URL:	-
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Mahalingam
Middle Name:	-
First Name:	Srinivaasan
Department:	-
Mobile:	
Direct FAX:	+91 80 25586119
Direct tel:	
Personal E-Mail:	msrini66@yahoo.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Parties included in Annex 1. There is no diversion of Official Development Assistance fund for the project activity.

Annex 3

BASELINE INFORMATION

AMS IIIH/ version 04 specifies to determine the eelectricity baseline emission factor of the grid as per AMS I.D.

The project activity is in Karnataka state in India which is part of southern regional grid. Hence, southern regional grid has been considered for electricity baseline emission factor.

Central Electricity Authority, (CEA) is the statutory organisation and its main objective is to advise the Government of India (Host Party) on the matters relating to the national electricity policy, formulate short-term and perspective plans for development of the electricity system and coordinate the activities of the planning agencies for the optimal utilization of resources to sub serve the interests of the national economy and to provide reliable and affordable electricity to all consumers. CEA has made an elaborate study and has determined electricity baseline emission factor for all grids in India for both the options of weighted average emissions and on combined margin approach which is as per AMS I.D. The latest emission factor of the southern regional grid would be considered for electricity baseline emission factor. The latest data is available for the year 2004-05 which is adopted. Since the emission factor is considered for estimation of project activity emissions, the highest value would be adopted for estimation of project activity emissions due to electricity consumed by the facilities.

The following table gives various latest baseline emission factors for various approaches :

A-3-1Baseline emission factor of southern regional grid for various approaches

Year	Approach	Value
2004-2005	Weighted average emissions **excluding** imports from other grids	0.79 t CO_2/ MWh
2004-2005	Weighted average emissions **including** imports from other grids	0.79 t CO_2/ MWh
2004-2005	Combined Margin method **excluding** imports from other grids	0.86 t CO_2/ MWh
2004-2005	Combined Margin method **including** imports from other grids	0.86 t CO_2/ MWh

Since the electricity baseline emission factor of the grid is applied to calculate the project activity emissions only, the higher value of table A-3-1 (0.86 t CO_2/ MWh) would be adopted.

Annex 4

MONITORING INFORMATION

The monitoring of the project activity is as per paragraphs 9-13 of the approved small scale methodology AMS III.H/ version 4.

As per the methodology, "the emission reductions of the project activity shall be based on the amount of methane recovered and fuelled or flared, that is monitored ex-post, using continuous flow meters. The project emissions and leakage will be deducted from the emission reductions calculated from the methane recovered and combusted."

The calculations of emission reductions from the project activity as per above monitoring procedures shall be carried out as follows:

The quantity of biogas that is generated from the wastewater treatment plant shall be continuously measured by flow meters and recorded. From this data total biogas generated in the year "y", is calculated, which will be $Q_{y, biogas.}$

The methane content of biogas in percentage shall be measured once in a month and average value shall be adopted and this value would be $C_{CH4.}$

Average value of temperature and pressure of the biogas shall be measured as P_{CH4} and T_{CH4}. Using P_{CH4} and T_{CH4} , density of methane would be determined which would be D_{CH4}.

The emission reductions ER_y would be given by the following formula:

ER_y	=	$Q_{y, biogas}$	*	C_{CH4}	*	D_{CH4}	*	GWP_CH_4
(tCO_2e)		m^3		%		ton/m^3		$21\ tCO_2e/t\ CH_4$

The project emissions shall be calculated as described in the section B.6.1. and deducted from emission reductions to calculate the emission reductions of the project activity.

While calculating the project emissions due to inefficiencies of the capture and flare, a default value of 0.9 shall be used when the biogas is combusted in the flare. When biogas is combusted in the heating equipment, a default value of 0.99 shall be used for the reason that, in the project activity the biogas is combusted along with bagasse in the boilers where all the biogas would combust and efficiency would be close to 100 %. This default value of 0.99 is as per latest version 04 of the approved methodology

AM0013, “avoided emissions due to organic wastewater treatment” which allows a combustion efficiency of 99 % in heating / electricity generation equipment. All the biogas generated in the project activity would be consumed in the heart generating equipment. However during maintenance of heat generating equipment, there may be occasions hen flare is used to combust the biogas. The number of hours of operation of flare shall be monitored as H_{flare} and the quantity of biogas flared shall be obtained by multiplying the flare capacity and number of hours of operation of flare. A default value of 0.9 shall be used for flare efficiency and a default value of 0.99 shall be used when biogas is consumed in the heating equipment.

Regular maintenance of the flare would be ensured as per manufacturer recommendation.

Sludge from UASB digesters

The final sludge from UASB digesters is drained periodically form the digesters. Since these digesters are there inside UASB digesters for sufficiently long time, it would have completely digested and would not decay any further. This sludge could be directly used for soil application. However, to avoid any minor decay that may happen due to the sludge, this sludge is mixed with pressmud and composted aerobically. Since the sludge is aerobically composted, anaerobic decay would not happen. The quantity of sludge generated and disposed in compost yard would be monitored.