# AWMS METHANE RECOVERY PROJECT MX07-S-110, CHIHUAHUA, MÉXICO

UNFCCC Clean Development Mechanism
Simplified Project Design Document
for
Small Scale Project Activity

AgCert

**DOCUMENT ID: MX07-S-110**
**VER 3, 28 DECEMBER 2007**

**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.<br>• 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:

AWMS Methane Recovery Project MX07-S-110, Chihuahua, México, Ver. 03, 28 December 2007

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

**Purpose:** The purpose of this project is to mitigate and recover animal effluent related GHG by improving AWMS practices.

Worldwide, agricultural operations are becoming progressively more intensive to realize economies of production and scale. The pressure to become more efficient drives significant operational similarities between farms of a "type," as inputs, outputs, practices, genetics, and technology have become similar around the world.

This is especially true in livestock operations (swine, dairy cows, etc.) which can create profound environmental consequences, such as greenhouse gas emissions, odour, and water/land contamination (including seepage, runoff, and over application), that result from storing (and disposing of) animal waste. Confined Animal Feeding Operations (CAFOs) use similar Animal Waste Management System (AWMS) options to store animal effluent. These systems emit both methane ($CH_4$) and nitrous oxide ($N_2O$) resulting from both aerobic and anaerobic decomposition processes.

**Explanation of GHG emission reductions:** This project proposes to apply the Methane Recovery methodology identified in Section III.D, of the Indicative Simplified Baseline and Monitoring Methodologies for Small-Scale CDM Project Activity Categories, to a dairy cattle operation located in Chihuahua, México. The proposed project activities will mitigate and recover AWMS GHG emissions in an economically sustainable manner, and will result in other environmental benefits, such as improved water quality and reduced odour. In simple terms, the project proposes to move from a high-GHG AWMS practice, an open air lagoon, to a lower-GHG AWMS practice, an anaerobic digester with capture and combustion of resulting biogas.

**Contribution to sustainable development:** Establishing a positive model for livestock operations is essential. In the years 1993 to 2004, Mexican dairy cattle population grew by approximately 37%. In 2004, the dairy cattle inventory in México was 2,234,246.[1] Producers in Chihuahua make up approximately 11.35% of that inventory.

Dairy cattle produce about 195 lbs of raw manure per day.[2] The proper handling of this large quantity of animal waste is critical to protecting human health and the environment. Because of the practices employed by farmers, the design, location, and management practices of livestock operations are critical components in ensuring an adequate level of protection of human health and the environment.[3]

Solid separators are currently used on some dairy farms to separate high-cellulose bedding material from flushed (liquid) manure. These separators are typically placed to extract the bedding material from the

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[1] http://www.siea.sagarpa.gob.mx/ar_compec_pobgan.html

[2] Weida, William J. "A Citizens Guide to the Regional Economic and Environmental Effects of Large Concentrated Dairy Operations," GRACE Factory Farm Project November, 19, 2000, Table II-2

[3] Speir, Jerry; Bowden, Marie-Ann; Ervin, David; McElfish, Jim; Espejo, Rosario Perez, "Comparative Standards for Intensive Livestock Operations in Canada, Mexico, and the U.S.," Paper prepared for the Commission for Environmental Cooperation.

liquid manure before it enters the anaerobic lagoon. Many government agencies in Mexico have issued directives to farms to collect as much manure as possible and dispose of it in anaerobic lagoons. To comply with these directives, dairy farms are now scraping manure from areas where there are no facilities for removal by flushing mechanisms. Some farms have installed mixing basins (called "carcamos" in Spanish) to mix scraped manure with the liquid manure from flushing. On such sites, all manure mixed in this manner can flow through the solid separator.

This methane recovery project activity will upgrade livestock operations infrastructure. The infrastructure improvement is in direct alignment with Mexico's national goals and objectives for agriculture, livestock, rural development, fishing and nutrition as outlined in the Mexican government's *Plan Nacional de Desarrollo, 2001 –2006* (National Development Plan, 2001 -2006).[4]

This project activity will have positive effects on the local environment by improving air quality (i.e., reducing the emission of Volatile Organic Compounds (VOCs) and odour) and will set the stage for future on-farm projects (i.e., changes in land application practices) that will have an additional positive impact on GHG emissions with an attendant potential for reducing groundwater contamination problems.

This project activity will also increase local employment of skilled labour for the fabrication, installation, operation and maintenance of the specialized equipment. Finally, this voluntary project activity will establish a model for world-class, scalable animal waste management practices, which can be duplicated on other CAFO livestock farms throughout México, dramatically reducing livestock related GHG and providing the potential for a new source of revenue and green power.

The proposed methane recovery project uniquely satisfies the Mexican government priorities for environmental stewardship and sustainability while positioning rural agricultural operations to develop and use renewable ("green") power. Indeed, it does so with no negative consequences and with a series of environmental and infrastructure co-benefits.

Because the proposed project establishes an advanced AWMS the project participants believe the farm managers will adopt – and continue to practice – AWMS practice changes that result in meaningful, and permanent, GHG emission reductions beyond the project's expected lifespan.

## 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) |
|---|---|---|
| México (host) | • AgCert International plc<br>• AgCert México Servicios Ambientales, S. de R.L. de C.V. | No |

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

[4] http://www.sagarpa.gob.mx/Dgg/sectorial.htm

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

#### A.4.1.1. Host Party(ies):

The host party for this project activity is **México.**

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

The project will be located in **Chihuahua.**

#### A.4.1.3. City/Town/Community etc:

The project sites are shown in Figure A1 with specifics detailed in Table A1.

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

The physical location of each of the sites involved in this project activity is shown in Figure A1 and listed in Table A1.

**Rancho Productor de Leche Zaragoza Hermanos SA de CV** owns one dairy cattle operation in Delicias, Chihuahua:

- Rancho Productor de Leche Zaragoza Hermanos SA de CV (4132220) had approximately 15,095 animals on site between October 2005 and September 2006. Containment areas include 5 corrals with paved feed lanes, 3 milking rooms, and 3 holding areas. From these areas, manure is, removed with a tractor, a hose, taken out with a scraper, or by the pull-plug method. It is routed to the site's AWMS where it is gravity fed through a solid separator and then flows to the containment area which consists of one primary open lagoon approximately 150m x 80m x 6m. Effluent is disposed of from the lagoons through subsurface and surface irrigation. Construction of the proposed anaerobic digester is expected to be complete on 6 July 2007.

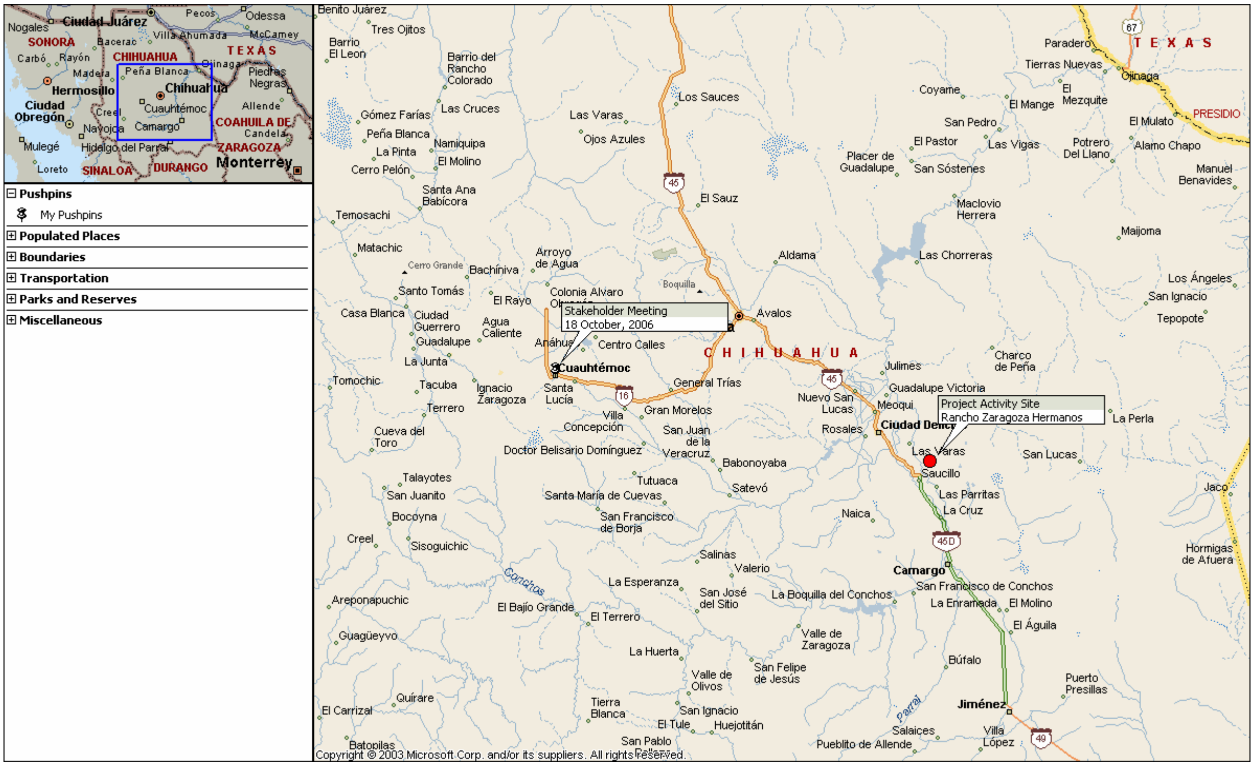



**Figure A1. Project Activity Sites in Chihuahua, México**

**Table A1. Detailed physical location and identification of project sites**

| Legal Entitity | Farm/Site Name | AgCert ID | Address | Town / State | Contact | Phone | GPS Coord |
|---|---|---|---|---|---|---|---|
| Rancho Productor de Leche Zaragoza Hermanos SA de CV | Rancho Productor de Leche Zaragoza Hermanos SA de CV | 4132220 | Carretera Panamericana Km.130 Lote 555 | Delicias, Chihuahua | Jose Carreon Ramos | 63 9472-2193 | 28° 08' 46.3'' N 105° 24' 57.8'' W |

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

The project activity described in this document is classified as a Type III, Other Project Activities, Category III.D./Ver.11, Methane recovery in agricultural and agro industrial activities.

The project activity will capture and combust methane gas produced from the decomposing manure of dairy cattle farm located in Chihuahua, México.

The technology to be employed by the project activity includes the installation of new covered lagoons creating an anaerobic digester. The system will be comprised of a lined and covered lagoon creating a digester with sufficient capacity and Hydraulic Retention Time (HRT) to greatly reduce the volatile solids loading in the effluent. The cover consists of a synthetic high density polyethylene (HDPE) geomembrane, which is secured to the liner by means of an anchor trench around the perimeter. HDPE is the most commonly used geomembrane in the world and is well suited for use in this project. HDPE is an excellent product for large applications that require UV, ozone, and chemical resistance. The digester has been designed to permit solids residue removal without breaking the gas retention seal. Processed effluent from the digester(s) will be routed to a secondary and tertiary lagoon system, as needed, and captured biogas will be routed to a highly efficient combustion system to destroy methane gas produced. Special maintenance procedures have been developed to ensure proper handling and disposition of the digester sludge.

The flaring combustion system is automated to ensure that all biogas that exits the digester and passes through the flare (and flow meter) is combusted. Pressure control devices within the gas handling system maintain proper biogas flow to the combustion system. A continuous ignition system ensures methane combustion whenever biogas is present at the flare. Two (2) sparking electrodes provide operational redundancy. If biogas is present in the flare, it is immediately ignited by the sparking system. If biogas is not present, the igniter sparks harmlessly approximately every 3 seconds. This continuous ignition system is powered by a robust solar module (solar-charged battery system) that operates independently from the power grid. With a fully charged battery, the module will provide power to the igniter for up to two weeks without sunlight. The component parts are verified functional on a periodic basis in accordance with manufacturer and other technical specifications.

Technology and know-how transfer:

The project developer is implementing a multi-faceted approach to ensure the project, including technology transfer, proceeds smoothly. This approach includes careful specification and design of a complete technology solution, identification and qualification of appropriate technology/services providers, supervision of the complete project installation, farm staff training, ongoing monitoring (by the project developer) and developing/implementing a complete Monitoring Plan using project developer staff. As part of this process, the project developer has specified a technology solution that will be self-sustaining (i.e., highly reliable, low maintenance, and operate with little or no user intervention). The materials and labour used in the base project activity are sourced from the host country whenever economically possible.

By working so closely with the project on a “day-to-day” basis, the project developer will ensure that all installed equipment is properly operated and maintained, and will carefully monitor the data collection and recording process. Moreover, by working with the farm staff over many years, the project developer will ensure that the staff acquires appropriate expertise and resources to operate the system on an ongoing/continuous basis.

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

**ESTIMATED AMOUNT OF EMISSION REDUCTIONS OVER THE 10 YEAR CREDITING PERIOD**

| **A.4.3 - Estimated Emission Reductions over chosen Crediting Period** | |
|---|---|
| **Years** | **Annual estimation of emission reductions in tonnes of $CO_2$e** |
| Year 1 | 35,484 |
| Year 2 | 35,484 |
| Year 3 | 35,484 |
| Year 4 | 35,484 |
| Year 5 | 35,484 |
| Year 6 | 35,484 |
| Year 7 | 35,484 |
| Year 8 | 35,484 |
| Year 9 | 35,484 |
| Year 10 | 35,484 |
| **Total estimated reductions** (tonnes $CO_2$e) | 354,840 |
| **Total number of crediting years** | 10 |
| **Annual average over the crediting period of estimated reductions** (tonnes of $CO_2$e) | 35,484 |

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

There is no official development assistance being provided for this project.

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

Based on paragraph 2 of Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities,[5] this project is not debundled. There are no other registered large-scale CDM project activities with the same project participants, in the same project category and technology/measure whose project boundary is within 1 km of another proposed small-scale activity.

**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:**

[5]http://cdm.unfccc.int/Projects/pac/howto/SmallScalePA/sscdebund.pdf

The project activity is a Type III, Other Project Activities, Category III.D./Ver.11, Methane recovery in agricultural and agro industrial activities. The project is a small scale project because it comprises methane recovery from agro-industries, and project emissions are less than 15 kt $CO_2$eq.

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

The simplified methodologies are appropriate because the project activity site is considered an agro-industry and GHG emissions calculations can be estimated using internationally accepted IPCC guidance.

The project activity will capture and combust methane gas produced from the decomposing manure at a dairy cattle farm located in Chihuahua, México. This simplified baseline methodology is applicable to this project activity because without the proposed project activity, methane from the existing AWMS would continue to be emitted into the atmosphere. The proposed project activity will change the current animal waste management practice to that which uses an anaerobic digestion system equipped with a methane recovery and combustion system. Based on historical animal inventories and baseline estimates, the estimated emission reductions of the project activity will not exceed 60 kt $CO_2$e in any year of the crediting period as shown in Section A.4.3.

## B.3. Description of the project boundary:

The project boundary is illustrated in Figure B1. It describes the basic layout of the project farm in a schematic format. The proposed project boundary considers the GHG emissions that come from AWMS practices, including the GHG resulting from the capture and combustion of biogas using the technology described in Section A.4.2.

The project activity site uses a system of one or more lagoons. Proposed AWMS practice changes include the construction of a digester comprised of cells that capture the resulting biogas which is then combusted. Based on the methodology, the anaerobic digester is the physical boundary of the methane recovery facility.

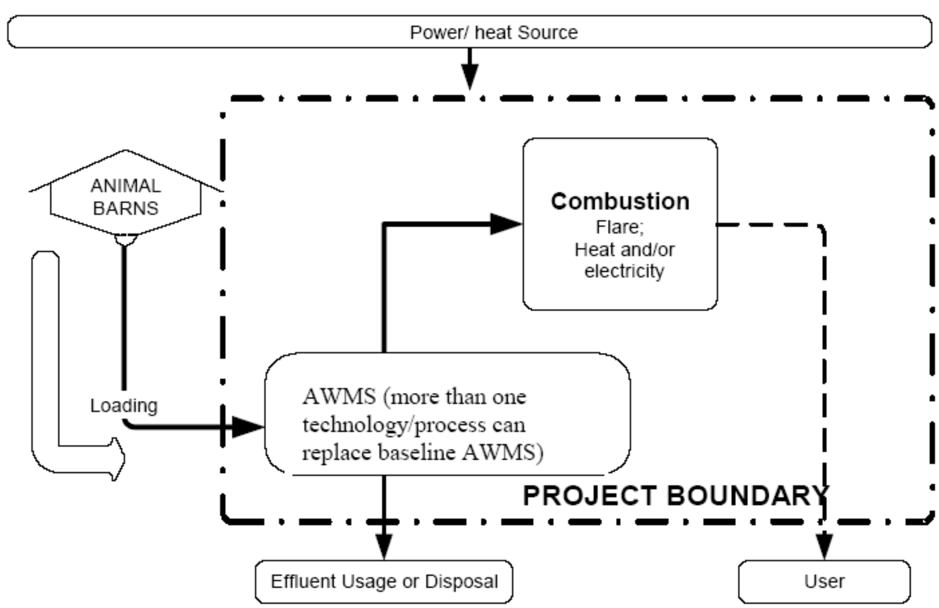
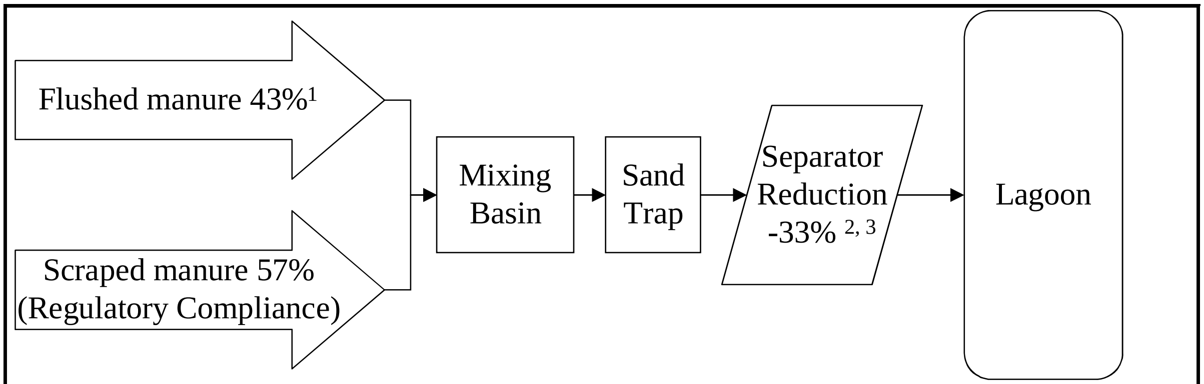



**Figure B1. Project Boundary**

Solid separators are used on some dairy farms to separate bedding material from flushed (liquid) manure. During the separation process, a small percentage of volatile solids (Vs) are also removed, thereby

potentially impacting the baseline production of methane in the anaerobic lagoon. AgCert commissioned third party measurements of six (6) dairy sites in Mexico to determine the impact on Vs. The results ranged averaged 33% Vs reduction by the stationary inclined screen separator as shown in Figure B2.

The overall estimated reduction on baseline methane from all dairy farm manure on farms where mixing basins are used to combine all scraped manure with flushed manure is 33% (based on the conservative assumption that the high-cellulose separated Vs has the same biological methane potential as the Vs in the liquid manure that flows into the lagoon).




Sources
1. Average observed on AgCert Mexican Dairy Project Sites
2. Average Volatile Solids Reduction on 5 AgCert Mexican Project Sites with Separators
3. Current conservative assumption that the high-cellulose separated Vs has the same biological methane potential as the Vs in the liquid manure.

**Figure B2. Average Vs reduction on sites with solids separators**

## B.4. Description of baseline and its development:

The amount of methane that would be emitted to the atmosphere in the absence of the project activity can be estimated by referring to Section 10.44 through 10.47 of the 2006 IPCC Guidelines for National GHG Inventories.

The baseline for this project activity is defined as the amount of methane that would be emitted to the atmosphere during the crediting period in the absence of the project activity. The methane emissions are calculated ex-ante using the most recent IPCC approach, which permits the use of default data.[6] Direct use of the IPCC formula is not possible since no country-specific data for Mexico is available. VS values are calculated by using IPCC 2006 North American diary default VS excretion values and IPCC 2006 default values for body weight. The rationale for using North America values is that the predominant genetic strains of diary used in commercial operations in Mexico are of North American origin; therefore, diary in Mexican commercial operations reflect the values of North American diary. Furthermore, the default values from IPCC 2006 for Latin American diary are not realistic for commercial diary operations in Mexico as they would not be economically sustainable. Compared with North American IPCC 2006 default values for body weight and VS excretion, use of the Latin American default values in weight adjusted calculations are not the most conservative values as they tend to overestimate VS excretion. VS values for each subgroup of diary are then calculated using country specific average bodyweight for that subgroup as a ratio of IPCC 2006 default bodyweight for that subgroup. This ratio is then multiplied by

[6] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_10_Ch10_Livestock.pdf , p. 10.42

the IPCC 2006 default VS excretion rate for that subgroup of diary. In order to remain conservative, this approach uses IPCC default values and weight adjustments in the absence of country-specific data.[7]

In this case an open lagoon is considered the baseline and estimated emissions are determined as follows:

**Step 1 – Livestock Population**

Animal populations for the project activity sites are described in Annex 3. To determine the population for Equation B.2, the most recent twelve months of animal inventory provided by the producer is used to calculate a monthly average per animal type, unless otherwise noted in Annex 3.

The AWMS used on the farms is an open lagoon, unless otherwise noted in Section A.4.1.4.

**Step 2 – Emission Factors**

The emission factor for the animal group is:

$$EF_i = VS_i * n_m * B_{0i} * 0.67kg/m3 * MCF_{jk} * MS\%_{ijk}$$

*Equation B1*[8]

Where:

| | | |
|---|---|---|
| *EFi* | = | emission factor (kg) for animal type i (e.g., dairy cows, weight adjusted), |
| *VSi* | = | Volatile solids excreted in kg/day for animal type i, default volatile solids value in Section B.6.2, Table B.2 (adjusted as Vs =($W_{site}$/$W_{default}$[9])*$VS_{IPCC}$) |
| $n_m$ | = | Number of days animals present, |
| $B_o$ | = | Maximum methane producing capacity ($m^3$/kg of *VS*) for manure produced by animal type i, |
| $MCF_{jk}$ | = | Methane conversion factor for each manure management system j by climate region k; and |
| $MS\%_{ijk}$. | = | fraction of animal type i's manure handled using manure system j in climate region k. |

The amount of methane emitted can be calculated using:

$$CH_{4a} = EF_i * Population_{year}$$

*Equation B2*[10]

Where:

| | | |
|---|---|---|
| $CH_{4a}$ | = | methane produced in kg/yr for animal type i, |
| $EF_i$ | = | emission factor (kg) for animal type i (e.g., dairy cows), |

[7] http://books.nap.edu/openbook.php?record_id=6016&page=111

[8] 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Page 10.41, equation 10.23 and Page 10.77, Table 10A-4.

[9] Obtained from 2006 IPCC, Table 10A-4, page 10.77

[10] Adapted from 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Page 10.41.

$Population_{year}$ = yearly average population of animal type i.

**Step 3 – Total Baseline Emissions**

To estimate total yearly methane emissions the selected emission factors are multiplied by the associated animal population and summed.

$$BE = [CH_{4a} * GWP_{CH4}]/1000*sd$$

*Equation B3*[11]

Where:

| | | |
|---|---|---|
| $BE$ | = | Baseline carbon dioxide equivalent emission in metric tons per year, |
| $CH_{4a}$ | = | Annual methane produced in kg/yr for animal type I, |
| $GWP_{CH4}$ | = | Global warming potential of methane (21) |
| sd | = | Deduction percentage for solid separation |

AgCert will reduce the Total Emission Reductions in Table B.6. by the conservative amount of 33%.

**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:**

Anthropogenic GHGs, specifically methane, are released into the atmosphere via decomposition of animal manure. Currently, this farm-produced biogas is not collected or destroyed.

The proposed project activity intends to improve current AWMS practices. These changes will result in the mitigation of anthropogenic GHG emissions, specifically the recovery of methane, by controlling the lagoon's decomposition processes and collecting and combusting the biogas.

There are no existing, pending, or planned national regulatory requirements that govern GHG emissions from agro-industry operations (specifically, dairy production activities) as outlined in this PDD. However, the regional governments of several states do have recommendations that producers use open lagoons for manure management systems in order to maintain and improve the prevention, control and eradication of illness among the animals, with an emphasis on those that affect public health:

> *"The government of the state of Chihuahua, with the objective of promoting better practices of… proper animal waste management generated by agricultural activities, […] that has adverse environmental effects to the local population […] (the government) recommends that farms take the necessary actions for the control and treatment of the waste produced by the development of dairy cattle through the construction and operation of anaerobic lagoons, as these systems avoid, as much as possible, the inconvenient impacts to the environment [...]"*

-C.P.Reyes Ramón Cadena Payán, El Secretario de Desarrollo Rural for the state of Chihuahua

In addition, the Chihuahua state government issued a statement through its Secretary of Agriculture indicating it "regulates, promotes, and recommends" activities to "always maintain the value of environmental conservation."

[11] Adapted from Equation 9, page 12, AM0016/version 02, 22 October 2004 / UNFCCC / CDM Meth Panel

The project participants have solicited information regarding this issue during numerous conversations with local and state government officials and through legal representation and have determined there is no regulatory impetus for producers to upgrade current AWMS beyond the recommended open air anaerobic lagoon. The following paragraphs discuss the Mexican dairy industry and how conditions hinder changes in AWMS practices.

Assessment of barriers:

Absent CDM project activities, the proposed project activity has not been adopted on a national or worldwide scale due to the following barriers:

a) *Investment Barriers***:** This treatment approach is considered one of the most advanced AWMS systems in the world. Only a few countries have implemented such technology because of the high costs involved in the investment compared to other available systems.

   Mexican dairy producers face the same economic challenges as farmers in other nations due to increased worldwide production and low operating margins. Farm owners focus on the bottom line. Odour benefits, potential water quality enhancements, and the incremental savings associated with heating cost avoidance, are rarely enough to compel farmers to upgrade to an (expensive) advanced AWMS system.[12] Unless the AWMS upgrade activity affords the producer the means to (partially) offset the practice change cost (via the sale of Certified Emission Reduction (CER) credits, for instance) the open lagoon will remain the common AWMS practice – *and all AWMS GHG biogas will continue to be emitted*.

   Producers view the AWMS as a stage that is outside of the production process and have difficulty financing changes that should be undertaken. Even banks have been unwilling to finance such activities absent government guarantees or other incentives.

b) *Technology barriers***:** Anaerobic digester systems have to be sized to handle projected animal/effluent volumes with a Hydraulic Retention Time (HRT) consistent with extracting most/all methane from the manure. These systems become progressively more expensive on a ‘per animal’ basis as farm animal population (i.e., farm size) is decreased. Moreover, operations and maintenance requirements involved with this technology, including a detailed monitoring program to maintain system performance levels, must also be considered. Worldwide, few anaerobic digesters have achieved long-term operations, due primarily to inappropriate operations and maintenance.

c) *Legal barriers***:** The implementation of this project activity by these farms highly exceeds current Mexican regulations for dairy waste treatment. Apart from existing legislation in México that establishes water quality parameters that require that water supplies be protected from contamination and recommendations that producers use open lagoons to collect and process all manure produced on site, there is no legislation in place that requires specific dairy manure treatment as it relates to the emission of GHG.

An analysis was performed to assess whether the basis in choosing the baseline scenario is expected to change during the crediting period and the results follow:

a) *Legal constraints*: There is no expectation that Mexican legislation will require future use of digesters due to the *significant* investments required. Further, there is no expectation that México will pass any legislation which deals with the GHG emissions. Indeed, the developer is aware of no Latin American or other worldwide location requiring either the use of digesters or the constraints of agricultural GHG emissions. Qualitatively, this is the most likely “risk” area

[12] DiPietre, Dennis, PhD, Agricultural Economist, (18 June 2003) Private communication

associated with possible changes in the baseline scenario. Overarching environmental regulations have to balance creating a legislative framework that enables agricultural production against social pressures to make industrialized livestock operations “good neighbours.” México has successfully grown this sector, building upon low operating costs and technically expert labour.

*Common practice*: While past practices cannot predict future events, it is worth noting that sites included in this project activity have been in existence for many years, during which time, the prevailing AWMS practice was open lagoons.

**B.6. Emission reductions:**

**B.6.1. Explanation of methodological choices:**

**Baseline Emissions**

Baseline emissions are calculated as described in section B.4.

**Project Emissions**

The amount of methane that would be emitted to the atmosphere due to the project activity and within the project boundaries can be estimated by referring to Table 10.17 of the 2006 IPCC Guidelines for National GHG Inventories.

The project emissions for this project activity are defined as the amount of methane that would be emitted to the atmosphere during the crediting period due to the project activity. In this case an anaerobic digester is considered the project activity and estimated emissions are determined as follows:

**Step 1 – Livestock Population**

Livestock populations for the project activity sites are described in Annex 3. The AWMS proposed for use on the farm is an anaerobic digester.

**Step 2 – Emission Factors**

The emission factor for the animal group is:

$$EF_i = VS_i * n_m * B_{0i} * 0.67kg/m3 * MCF_{jk} * MS\%_{ijk}$$

*Equation B4*[13]

Where:

| | | |
|---|---|---|
| $EF_i$ | = | emission factor (kg) for animal type i (e.g., dairy, weight adjusted), |
| $VS_i$ | = | Volatile solids excreted in kg/day for animal type I, default volatile solids value in Section B.6.2, Table B2 (adjusted as $Vs = (W_{site}/W_{default}$[14]$)*VS_{IPCC}$) |
| $n_m$ | = | Number of days animals present, |
| $B_o$ | = | Maximum methane producing capacity ($m^3$/kg of *VS*) for manure produced by animal type i, |

[13] 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Page 10.41, Equation 10.23 and Page 10.77, Table 10A-4.

[14] Obtained from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 10A-4, page 10.77

| | | |
|---|---|---|
| $MCF_{jk}$ | = | Methane conversion factor for each manure management system j by climate region k; and |
| $MS\%_{ijk}$. | = | fraction of animal type i's manure handled using manure system j in climate region k. |

The amount of methane emitted can be calculated using:

$$CH_{4a} = EF_i * Population_{year}$$

*Equation B5*[15]

<u>Where:</u>

| | | |
|---|---|---|
| $CH_{4a}$ | = | methane produced in kg/yr for animal type i, |
| $EF_i$ | = | emission factor (kg) for animal type i (e.g., dairy), |
| $Population_{year}$ | = | yearly average population of animal type i. |

To estimate total yearly methane emissions the selected emission factors are multiplied by the associated animal population and summed.

$$PE = [CH_{4a} + FE] * GWP_{CH4} / 1000$$

*Equation B6*[16]

<u>Where:</u>

| | | |
|---|---|---|
| $PE$ | = | Project activity carbon dioxide equivalent emission in metric tons per year, |
| $CH_{4a}$ | = | annual methane produced in kg/yr for animal type i, |
| $FE$ | = | annual methane emitted from flare due to inefficiency |
| $GWP_{CH4}$ | = | global warming potential of methane (21) |

**<u>Leakage</u>**

In accordance with the baseline methodology, leakage calculations are not required.

**<u>Emission Reductions</u>**

The ex-ante baseline emissions calculated as described in section B.4 of this PDD will be compared to the actual monitored amount of methane captured and combusted by the project activity. The lesser of these values will be used as the project emission reductions of the crediting period.

$$ER_{net} = BE - (PE + DE)$$

*Equation B7*

<u>Where:</u>

| | | |
|---|---|---|
| $BE$ | = | Baseline carbon dioxide equivalent emission in metric tons per year, |

[15] Adapted from 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Page 10.41.

[16] Adapted from Equation 9, page 12, AM0016/version 02, 22 October 2004/UNFCCC/CDM Methodology Panel

*PE* = Project activity carbon dioxide equivalent emission in metric tons per year,

*DE* = Direct emissions from use of fossil fuels or electricity for operation of facility

According to the methodology, direct emissions from the use of fossil fuels and/or electricity for the operation of the facility must be considered as part of the project emissions. For dairy farms in Mexico, a standard equipment configuration is shown in Table B1.

**Table B1, Equipment configuration for dairy site**

| Equipment | Total HP Rating | kW equivalent | Hours in operation per day | kWh per day consumption | # days in operation per year | kWh consumption per year |
|---|---|---|---|---|---|---|
| Digester mixer (s) | 10 | 7.46 | 24 | 178.97 | 365 | 65,323 |
| Manure heating recirculation pump | 10 | 7.46 | 24 | 178.97 | 365 | 65,323 |
| Boiler/heat exchanger recirculation pump | 3 | 2.24 | 24 | 53.69 | 365 | 19,597 |
| Blower | 1 | 0.75 | 24 | 17.90 | 365 | 6,532 |
| | | | | | **Total:** | **156,776** |

$$\text{HP to kWh conversion} = \text{HP x hours per day x days a year (365) x } 0.7457^{17}$$

As such, the electrical consumption per year per anaerobic digester for a dairy farm in Mexico is approximately 132,571 kWh/yr. To convert this number into metric tonnes of CO2e per year, the following formulae is applied:

$$\text{kWh to } CO_2e \text{ conversion} = (\text{kwh } (132{,}571) \text{ x country specific emission factor } (0.5133)^{18}) / 1000$$

Therefore, for each anaerobic digester, approximately 70.39 metric tonnes of $CO_2e$ are produced per year as a result of the project activity.

Because the digester is a sealed system, all methane is captured and flared, leaving none to be released to the atmosphere via physical leakage. In addition, the methane conversion factor, of the emission reduction calculations, includes a conservative 10% discount to compensate for intrinsic digester emissions.

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

Accurate data collection is essential. The farms included in this project activity use a standardized industry database package which captures a wide range of incremental production data to manage operation and enable the farm to maximize both productivity and profitability. AgCert uses some data collected from this system (referred to as "Farm Records" in Table B.2.). AgCert has a rigorous QA/QC system that ensures data security and data integrity. Spot audits of data collection activities are conducted on a regular basis.

AgCert has a data management system capable of interfacing with producer systems to serve as a secure data repository. Project activity data related uncertainties will be reduced by applying sound data collection quality assurance and quality control procedures. Table B.2. details data and parameters available at the time of validation.

---

[17] .7457 is the standard scientific conversion factor from horsepower (HP) to Kilowatt Hours (kWh) based on Ohm's Law

[18] 0.5133kg $CO_2$ / kWh Obtained from registered CDM project 1240: Hasars Landfill Gas Project

**Table B.2. Data / Parameter Values and References**

| | |
|---|---|
| Data / Parameter: | **GWP $CH_4$** |
| Data unit: | |
| Description: | Global Warming Potential of Methane |
| Source of data used: | Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* (Cambridge, UK: Cambridge University Press, 1996) |
| Value applied: | 21 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | |
| Comments: | |

| | |
|---|---|
| Data / Parameter: | **$Population_{year}$** |
| Data unit: | Number of animals |
| Description: | Annual average population of animal type |
| Source of data used: | Data collected on the AgCert Form B (Baseline data collection). |
| Value applied: | See Annex 3 Animal Inventory |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | Animal population used to estimate baseline and project emission estimates was based on a 12 month period of actual or projected operation production data. |
| Comments: | |

| | |
|---|---|
| Data / Parameter: | **$n_m$** |
| Data unit: | Number of days |
| Description: | Days animals resident in system per year |
| Source of data used: | Data collected on the AgCert Form B (Baseline data collection). |
| Value applied: | See Table B3 for Baseline Activity<br>See Table B4 for Project Activity |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | |
| Comments: | |

| | |
|---|---|
| Data / Parameter: | **$MS\%_{ijk}$** |
| Data unit: | Fraction or percentage |
| Description: | Percent of animal effluent used in system. |
| Source of data used: | Data collected on the AgCert Form B (Baseline data collection). |
| Value applied: | 100% |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | |
| Comments: | |

| | |
|---|---|
| Data / Parameter: | **$VS_i$** |
| Data unit: | Kg/day |
| Description: | Volatile solids excreted for animal type |
| Source of data used: | Obtained from 2006 IPCC, Annex 10A.2, Table 10A-4, p. 10.77<br>Obtained from 1996 IPCC, Appendix B, Table B-1, p.4.39 |
| Value applied: | 5.4 (Lactating cows)<br>3.47 (Dry cows)<br>2.86 (Heifers)<br>1.87 (Calves)<br>3.78 (Bulls) |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | |
| Comments: | |

| | |
|---|---|
| Data / Parameter: | **$B_{oi}$** |
| Data unit: | $m^3$/kg of *VS* |
| Description: | Maximum methane producing capacity for manure produced by animal type |
| Source of data used: | Obtained from 2006 IPCC, Annex 10A.2, Tables 10A-4 and 10A-5, p. 10.77 and 10.78 |
| Value applied: | .24 (Lactating)<br>.19 (Dry cows)<br>.19 (Heifers)<br>.19 (Calves)<br>.19 (Bulls) |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | |
| Comments: | |

| | |
|---|---|
| Data / Parameter: | **$MCF_{jk}$** |
| Data unit: | |
| Description: | Methane conversion factor for each manure management system |
| Source of data used: | Obtained from 2006 IPCC, Table 10.17, p. 10.45 for Baseline Activity<br>Obtained from 2006 IPCC, Table 10.17, p. 10.46 for Project Activity |
| Value applied: | Refer to 2006 IPCC, Table 10.17, p. 10.45 for Baseline Activity<br>Refer to 2006 IPCC, Table 10.17, p. 10.46 for Project Activity |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | |
| Comments: | |

| | |
|---|---|
| Data / Parameter: | **Days OB** |
| Data unit: | |
| Description: | Days out of barn |

| | |
|---|---|
| Source of data used: | Data collected on the AgCert Form B (Baseline data collection). |
| Value applied: | See Table B3 for Baseline Activity<br>See Table B4 for Project Activity |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | |
| Comments: | |

| | |
|---|---|
| Data / Parameter: | **BW kg** |
| Data unit: | Kg |
| Description: | Body weight of animals in kilograms. |
| Source of data used: | Obtained from 2006 IPCC, Annex 10A.2, Table 10A.2, p. 10.72 and 10.73 |
| Value applied: | See Table B3 for Baseline Activity<br>See Table B4 for Project Activity |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | |
| Comments: | |

## B.6.3 Ex-ante calculation of emission reductions:

Emission factors for the baseline are calculated as described in Section B.4. To estimate total yearly baseline methane emissions, the selected emission factors are multiplied by the associated animal population and summed.

**Table B.3. Baseline Emissions (Methane shown in metric tonnes of $CO_2$e)**

**Rancho Productor de Leche Zaragoza Hermanos SA de CV (4132220)**

| | $Population_{year}$ | $N_m$ | Days OB | Default VSi | Default BW | Ave BW, kg | $EF_i$ | $CH_4$ annual |
|---|---|---|---|---|---|---|---|---|
| Cows - Lactating: | 8522 | 365 | 0 | 3.6180 | 600 | 635 | 175.29 | 1,493,846.86 |
| Cows - Dry: | 1193 | 365 | 0 | 2.3249 | 500 | 600 | 101.11 | 120,626.25 |
| Heifers: | 2246.583333 | 365 | 0 | 1.9162 | 375 | 375 | 69.45 | 156,019.63 |
| Calves: | 4658.583333 | 365 | 0 | 1.2529 | 185 | 185 | 45.41 | 211,536.91 |
| Bulls: | 0 | 365 | 0 | 2.5326 | 800 | 800 | 91.79 | 0.00 |

Total Annual $CH_4$: 1,982,029.65

BE ($CO_2$e/year): 41,622.62

**Rancho Productor de Leche Zaragoza Hermanos SA de CV (4132220)**

| **Year** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Expected Growth %*** | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | |
| **Baseline Emissions (CO2e/year)** | 41,622.6 | 41,622.6 | 41,622.6 | 41,622.6 | 41,622.6 | 41,622.6 | 41,622.6 | 41,622.6 | 41,622.6 | 41,622.6 | **416,226.2** |

Emission factors for the project activity are calculated as described in Section B.6.1. To estimate total yearly project methane emissions, the selected emission factors are multiplied by the associated animal population and summed.

**Table B.4. Project Activity Emissions (Methane shown in metric tonnes of $CO_2e$)**

**Rancho Productor de Leche Zaragoza Hermanos SA de CV (4132220)**

| | $Population_{year}$ | $N_m$ | Days OB | Default VSi | Default BW | Ave BW, kg | $EF_i$ | $CH_4$ annual |
|---|---|---|---|---|---|---|---|---|
| Cows - Lactating: | 8522 | 365 | 0 | 3.618 | 600 | 635 | 22.47 | 191,518.83 |
| Cows - Dry: | 1193 | 365 | 0 | 2.3249 | 500 | 600 | 12.96 | 15,464.90 |
| Heifers: | 2246.583333 | 365 | 0 | 1.9162 | 375 | 375 | 8.90 | 20,002.52 |
| Calves: | 4658.583333 | 365 | 0 | 1.2529 | 185 | 185 | 5.82 | 27,120.12 |
| Bulls: | 0 | 365 | 0 | 2.5326 | 800 | 800 | 11.77 | 0.00 |

| | |
|---|---|
| Digester $CH_4$: | 254,106.37 |
| Flare $CH_4$: | 34,558.47 |
| Total Annual $CH_4$: | 288,664.83 |
| PE ($CO_2e$/year): | 6,061.96 |

**Rancho Productor de Leche Zaragoza Hermanos SA de CV (4132220)**

| **Year** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Expected Growth %*** | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | *0%* | |
| **Project Emissions (CO2e/year)** | 6,062.0 | 6,062.0 | 6,062.0 | 6,062.0 | 6,062.0 | 6,062.0 | 6,062.0 | 6,062.0 | 6,062.0 | 6,062.0 | **60,619.6** |

Using Equation B7 from Section B.6.1, the ex-ante baseline emissions calculated as shown in Table B.3 of this PDD will be compared to the actual monitored amount of methane captured and combusted by the project activity shown in Table B.4. The lesser of these values will be used as the project emission reductions of the crediting period.

Using the standard equipment configuration in Table B.1, direct emissions from the use of fossil fuels and/or electricity for the operation of the facility are considered as part of the project emissions.

For this particular project with 1 project activity site and a corresponding 1 anaerobic digester, the direct emission totals are as follows:

**Table B.5. Direct Emissions**

| **Source** | **Est kWh consumed / produced per year** | **Kg CO2e emitted per kWh produced** | **Metric Tonnes CO2e per year** |
|---|---|---|---|
| Direct emissions from use of electricity or fossil fuel | 149,421 | 0.5133 | 76.70 |

Because the digester is a sealed system, all methane is captured and flared, leaving none to be released to the atmosphere via physical leakage. In addition, the methane conversion factor of the emission reduction calculations include a conservative 10% discount to compensate for intrinsic digester emissions.

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

**Table B.6. Total Emission Reductions**

| **Table B.6. Total Emission Reductions (tonnes CO2e)** | | | | |
|---|---|---|---|---|
| ***Year*** | Estimation of project activity emissions (PE) | Estimation of baseline emissions (BE) | Direct emissions from electricity / fossil fuel (DE) | Estimation of overall emission reductions ($ER_{net}$ = BE - (PE + DE)) |
| *1* | 6,062 | 41,623 | 77 | **35,484** |
| *2* | 6,062 | 41,623 | 77 | **35,484** |
| *3* | 6,062 | 41,623 | 77 | **35,484** |
| *4* | 6,062 | 41,623 | 77 | **35,484** |
| *5* | 6,062 | 41,623 | 77 | **35,484** |
| *6* | 6,062 | 41,623 | 77 | **35,484** |
| *7* | 6,062 | 41,623 | 77 | **35,484** |
| *8* | 6,062 | 41,623 | 77 | **35,484** |
| *9* | 6,062 | 41,623 | 77 | **35,484** |
| *10* | 6,062 | 41,623 | 77 | **35,484** |
| **Total** (tonnes $CO_2$e) | 60,620 | 416,226 | 767 | **354,840** |

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

### B.7.1 Data and parameters monitored:

AgCert has designed and implemented a unique set of data management tools to efficiently capture and report data throughout the project lifecycle. On-site assessment (collecting Geo-referenced, time/date stamped data), supplier production data exchange, task tracking, and post-implementation auditing tools have been developed to ensure accurate, consistent, and complete data gathering and project implementation. Sophisticated tools have also been created to estimate/monitor the creation of high quality, permanent, ERs using IPCC formulae.

By coupling these capabilities with an ISO-based quality and environmental management system, AgCert enables transparent data collection and verification.

Metering devices used are designed to continuously and accurately measure biogas flow and are specially designed for corrosive environments. Meters are received from the factory fully-calibrated and retain calibration for the service life of the unit. Volumetric accuracy of the meter is permanent and non-adjustable. Accuracy is not affected by low or varying line pressures. Accuracy of the flowmeters utilized exceeds 99 percent across the entire measured rate curve with an uncertainty range of less than ± 1 percent. Periodic maintenance will be performed based on manufacturer specifications. Other equipment calibrations are accomplished using procedures developed by the project developer (Annex 4).

Methane concentration is determined using a standard gas analyser (Landtec GEM-500 or equivalent). The process is described in the Monitoring Plan. The measuring equipment is calibrated in accordance with the manufacturer specifications. The equipment is accurate to within 0.5%.

An industry standard gas analyser (Landtec GEM-500 or equivalent) will be used when measuring methane content of the biogas to determine the efficiency of the flaring process. The unit will be calibrated to an accuracy of ±1 percent.

See Table B.7 for specific parameters to be monitored.

**Table B.7. Data to be monitored**

| **Parameter:** | **SIR** |
|---|---|
| Unit: | Numeric frequency |
| Description: | Sludge removal count |
| Source of data: | Data collected on the AgCert Monthly Monitoring Form, if required. |
| Value of data: | |
| Brief description of measurement methods and procedures to be applied: | Measured as required. Sludge removal will be accomplished to ensure proper disposition so there is no resulting methane emissions. |
| QA/QC procedures to be applied (if any): | AgCert employs an internal QA audit process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported. |
| Any comment: | Data will be archived electronically and kept for the duration of the project + 2 years. |

| **Parameter:** | **BGP** |
|---|---|
| Unit: | Volume of $m^3$ |
| Description: | Biogas produced (cumulative) |
| Source of data: | Data collected on the AgCert Monthly Monitoring Form. |
| Value of data: | |
| Brief description of measurement methods and procedures to be applied: | Measured and recorded monthly.  A biogas meter will continuously measure the amount of biogas produced. |
| QA/QC procedures to be applied (if any): | AgCert employs an internal QA audit process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported. |
| Any comment: | Data will be archived electronically and kept for the duration of the project + 2 years. |

| **Parameter:** | **MC** |
|---|---|
| Unit: | Percentage |
| Description: | Methane content of biogas |
| Source of data: | Data collected on the AgCert Monthly Monitoring Form. |
| Value of data: | |
| Brief description of measurement methods and procedures to be applied: | Measured and recorded quarterly.  If significant deviations are observed, more frequent measurements will be taken until the values stabilize. |
| QA/QC procedures to be applied (if any): | AgCert employs an internal QA audit process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported. |
| Any comment: | Data will be archived electronically and kept for the duration of the project + 2 years. |

| **Parameter:** | **CEE** |
|---|---|
| Unit: | Percentage (fraction of time) |
| Description: | Combustion equipment efficiency (fraction of time in which gas is combusted) |
| Source of data: | Data collected on the AgCert Equipment Maintenance Log. |
| Value of data: | |
| Brief description of measurement methods and procedures to be applied: | Measured and recorded quarterly. The fraction of time will be determined as 100% less any time the flare is out of service and gas is flowing. Flare maintenance records will be used to make this determination. |
| QA/QC procedures to be applied (if any): | AgCert employs an internal QA audit process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported. |
| Any comment: | Data will be archived electronically and kept for the duration of the project + 2 years. |

| **Parameter:** | **EFP** |
|---|---|
| Unit: | Percentage |
| Description: | Efficiency of flaring process |
| Source of data: | Data collected on the AgCert Equipment Maintenance Log. |
| Value of data: | |
| Brief description of measurement methods and procedures to be applied: | Measured and recorded upon initial installation. Maintenance will be performed annually after installation to ensure optimal operation. |
| QA/QC procedures to be applied (if any): | AgCert employs an internal QA audit process that ensures monitoring activities are conducted in accordance with the monitoring plan and verifies the accuracy of data reported. |
| Any comment: | Data will be archived electronically or on paper and kept for the duration of the project + 2 years. |

**B.7.2 Description of the monitoring plan:**

A complete set of procedures and a Monitoring Plan (see Annex 4) has been developed to ensure accurate measurement of biogas produced and proper operation of the digester equipment. This plan exceeds the requirements outlined in the approved methodology outlined in Appendix B of the simplified modalities and procedures for small-scale CDM project activities as it applies to proposed project activity.

Further, AgCert has a trained staff located in the host nation to perform O&M activities including but not limited to monitoring and collection of parameters, quality audits, personnel training, and equipment inspections. The associated Monitoring Plan has been developed to provide guidance (work instructions) to individuals that collect and/or process data. AgCert staff will perform audits of farm operations personnel on a regular basis to ensure proper data collection and handling.

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

The final draft of the application of the methodology was completed on 25/01/2007.

The entity determining the baseline and monitoring methodology is AgCert International plc who is the project developer as well as a project participant. Contact information is listed in Annex 1.

## 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:

The starting date for this activity is 05/03/2007

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

The expected life of this project is 11y – 4m.

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

The project activity will use a **fixed** crediting period

#### C.2.1. Renewable crediting period

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

##### C.2.1.2. Length of the first crediting period:

#### C.2.2. Fixed crediting period:

##### C.2.2.1. Starting date:

The starting date of the crediting period is 01/03/2008. The crediting period will not start prior to the project registration.

##### C.2.2.2. Length:

The length of the crediting period is **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:

An environmental impact analysis is not required for this type of GHG project activity.

<u>Environment:</u>

There are no negative environmental impacts resulting from the proposed project activity.

Beyond the principal benefit of mitigating GHG emissions (the primary focus of the proposed project); the proposed activities will also result in positive environmental co-benefits. They include:

- Reducing atmospheric emissions of Volatile Organics Compounds (VOCs) that cause odour,
- Lowering the population of flies and associated enhancement to on-farm bio-security thus reducing the possible spread of disease.

The combination of these factors will make the proposed project site more "neighbour friendly" and environmentally responsible.

**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:**

No action required.

## SECTION E. Stakeholders' comments

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

AgCert invited stakeholders to meetings to explain the UNFCCC CDM process and proposed project activity. These meetings were held on **18 October 2006** in **Cuahutemoc, Chihuahua**, México.

AgCert issued invitations to government officials at the federal, state, and local levels. Furthermore, AgCert published announcements of the meetings in the newspaper, which cover **Chihuahua**.

These public announcements appeared in:

1. ***Periodico El Diario de Chihuahua, Chihuahua*** on **12 October, 2006**

All invitations were in the Spanish language. The meeting was attended by project participants and farm representatives. A full list of attendees and the meeting minutes are available on request.

**Gabriela Davila Elorza** of AgCert México gave a presentation, which covered the following topics: purpose of the meeting, background on global warming and the Kyoto Protocol, UNFCCC CDM process, process and responsibilities of the project, participants, equipment to be used for evaluation and audits, information management system, an example of project, benefits from the project (environmental and economic), and where to get further information.

AgCert has also participated as a speaker and described in detail this project in the Mexican government sponsored CDM workshops being presented throughout México.

**E.2. Summary of the comments received:**

After the presentations, attendees were afforded the opportunity to ask questions regarding the proposed project activities.

Sergio José Sepulveda de MUSACAT comento que el proyecto será muy bueno para su compañía porque quiere seguir creciendo y el estar contaminando en las cantidades que ya esta contaminando no le permiten crecer. Por tal razón, esta dispuesto a hacer lo cambios y modificaciones que sean necesarias para que el proyecto se pueda realizar en las mejores condiciones y así reducir el tiempo de espera para que de inicio la construcción.

Overall, the comments from the attendees at the stakeholders' meeting were positive and supportive of the project.

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

No action required.

## Annex 1

### CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| Project Participant: | |
|---|---|
| Organization: | AgCert México Servicios Ambientales, S. de R.L. de C.V. |
| Street/P.O. Box: | Homero 1804-1405 |
| Building: | Col. Chapultepec Morales |
| City: | México City |
| State/Region: | D.F. |
| Postfix/ZIP: | 11570 |
| Country: | México |
| Telephone: | |
| FAX: | |
| E-Mail: | |
| URL: | www.agcert.com |
| Represented by: | |
| Title: | |
| Salutation: | Mr. |
| Last Name: | Leo |
| Middle Name: | |
| First Name: | Perkowski |
| Department: | Regulatory |
| Mobile: | |
| Direct FAX: | +1 (780) 423.2368 |
| Direct tel: | +1 (321) 409.7842 |
| Personal E-Mail: | @agcert.com |
| **Project Developer and Participant:** | |
| Organization: | AgCert International plc |
| Street/P.O. Box: | Blackthorn Road Sandyford |
| Building: | Apex Building |
| City: | Dublin 18 |
| State/Region: | |
| Postfix/ZIP: | 18 |
| Country: | Ireland |
| Telephone: | |
| FAX: | |
| E-Mail: | |
| URL: | www.agcert.com |
| Represented by: | |
| Title: | CDM/JI Program Manager |
| Salutation: | Mr. |
| Last Name: | Perkowski |
| Middle Name: | S. |
| First Name: | Leo |
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| Direct tel: | +353 (0) 1 245-7400 |
| Personal E-Mail: | lperkowski@agcert.com |

## Annex 2

### INFORMATION REGARDING PUBLIC FUNDING

There is no official development assistance being provided for this project.

## Annex 3

### BASELINE INFORMATION

| | Month/Yr | Animal Type | | | | |
|---|---|---|---|---|---|---|
| | | Lactating Cow | Dry Cow | Heifer | Calf | Bull |
| Rancho Productor de Leche Zaragoza Hermanos SA de CV (4132220) | Oct-05 | 8,588 | 1,226 | 2,179 | 4,757 | 0 |
| | Nov-05 | 8,496 | 1,304 | 2,420 | 4,731 | 0 |
| | Dec-05 | 8,490 | 1,333 | 2,325 | 4,709 | 0 |
| | Jan-06 | 8,566 | 1,189 | 2,072 | 4,676 | 0 |
| | Feb-06 | 8,589 | 1,137 | 2,154 | 4,657 | 0 |
| | Mar-06 | 8,644 | 1,070 | 2,420 | 4,540 | 0 |
| | Apr-06 | 8,631 | 936 | 2,623 | 4,481 | 0 |
| | May-06 | 8,648 | 973 | 2,427 | 4,665 | 0 |
| | Jun-06 | 8,618 | 1,129 | 2,274 | 4,674 | 0 |
| | Jul-06 | 8,483 | 1,313 | 2,125 | 4,651 | 0 |
| | Aug-06 | 8,261 | 1,372 | 2,012 | 4,680 | 0 |
| | Sep-06 | 8,252 | 1,332 | 1,928 | 4,682 | 0 |

## Annex 4

## MONITORING INFORMATION

**Monitoring Plan**

**PURPOSE**

The purpose of this method specification is to describe the criteria for maintaining equipment, reporting equipment outages, and to provide detailed guidance for collection and processing of data that is used in the determination of Green House Gas (GHG) emissions.

**SCOPE**

This document applies to GHG Mitigation Project related activities. It applies to all personnel that operate and/or maintain project activity equipment and/or have an active role in data collection and processing.

**ASSOCIATED DOCUMENTS**

- UNFCCC approved monitoring methodology: AMS-III.D., Methane Recovery. http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_LM875Z64MVHWOE3JVL4BGGIC4SRUBE
- Jody Zall Kusek, and Ray C. Rist, June 2004. Ten Steps to a Results-based Monitoring and Evaluation System: A Handbook for Development Practitioners, World Bank. http://www.worldbankinfoshop.org/ecommerce/catalog/product?item_id=3688663
- Component guides / manuals for:
    - Manure transfer system
    - Anaerobic digester
    - Biogas transfer system including a biogas flow-meter
    - Combustion system (Flare)
    - Optional combustion system
- O & M Weekly Monitoring Checklist
- O & M Monthly Monitoring Form
- O & M Maintenance Log (en-br)
- O & M Maintenance Log (sp-mx)
- Farm Data Collection Procedure
- Animal Inventory Control
- Monthly Inventory Reporting
- Control of Nonconforming Product/Service
- Monitoring & Measurement of Product/Processes

- Control of Monitoring & Measurement Devices
- Equipment Calibration & Verification
- Competence, Training, and Awareness
- Form B – Swine – IPCC (en)
- Form B – IPCC – MX (sp)
- Form B – Dairy – IPCC (en), (sp), (pt)
- Bio-security and Safety
- Operations Manual $CO_2$ Analyzer
- EnviroCert Operations Management System (OMS)

**OPERATION AND MAINTENANCE ACTIVITIES**

**System Overview**

The Animal Waste Management System (AWMS) used in this project is shown in Figure 1. The system is made up of four (4) major system components:

- Manure transfer system which includes one lift station if needed
- Anaerobic digester cell(s)
- Biogas transfer system including a biogas flow-meter
- Combustion system (Flare)
- Optional combustion system

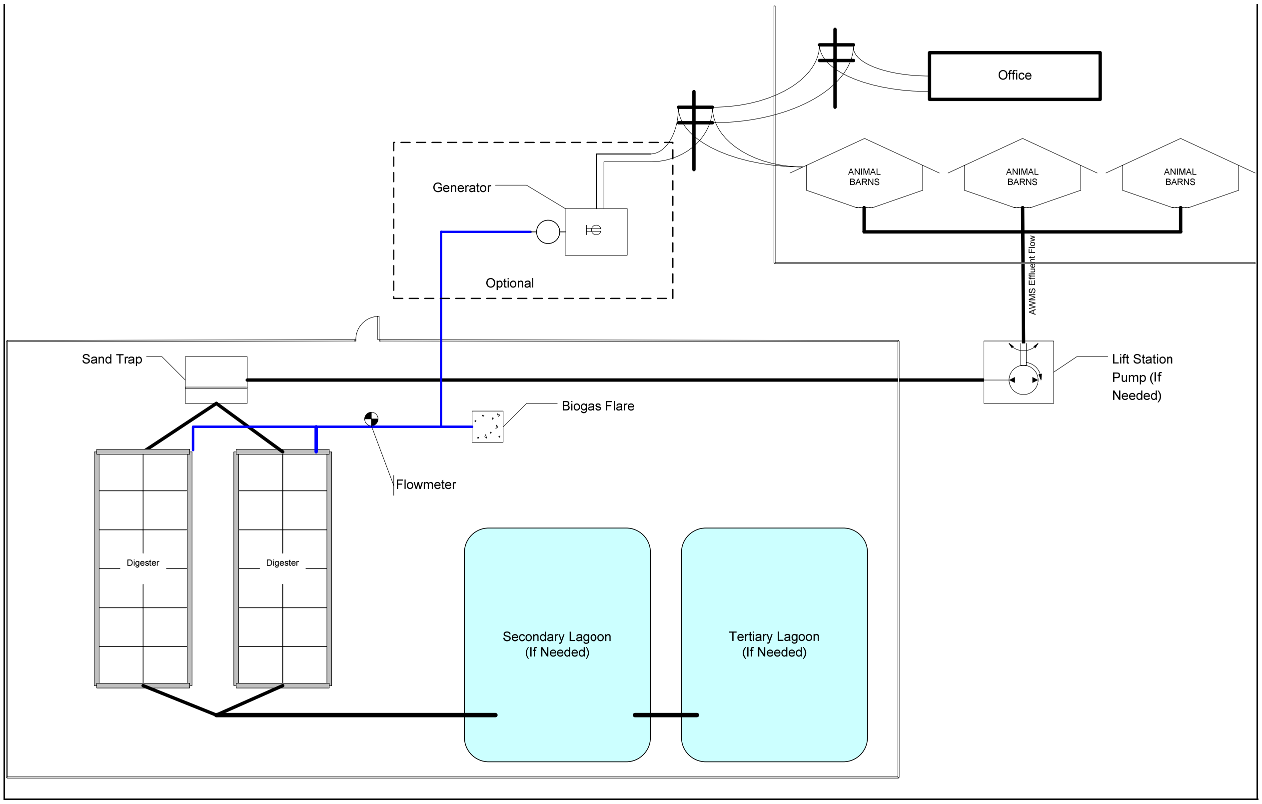


**Figure 1. Typical GHG Mitigation Project System Overview**

**System Components Operation Requirements**

**Manure Transfer System**

Training

Training on the Manure Transfer System shall be provided to the operations personnel by the system manufacturer and installer. Training shall include: system components, normal operation, emergency operations, maintenance, and request for warranty service. Training on reporting procedures shall be provided to the productions operations manager by AgCert.

Normal Operation

The system described in Figure 1 is a typical flush system with one optional lift station. Under normal conditions, farm hands clean the manure from the barns using water hoses and squeegees. This effluent is captured and then flushed from the barns periodically. Effluent from the barns is deposited in a lift station. Upon reaching predetermined threshold, the pump engages and routes the effluent to the digester cell. Upon being treated in the digester, the effluent is then routed from the digester to the storage lagoon. Liquid from the lagoon can then be used for irrigation.

Safety Issues and Emergency Preparedness

Care should be exercised when working around the lift station and distribution box (if installed) to avoid falling into the pit.

Weekly Inspection

A periodic inspection shall include the following:

- Check for pipeline obstructions
- Check for leaks in exposed pipelines
- Check for corrosion at exposed joints

Alternative Operating Procedures

In the event the manure transport system becomes unusable, the farm manager shall notify AgCert in accordance with the Emergency Maintenance section of this annex. Both parties shall work together to reach an acceptable alternate method to route the effluent so that farm operations are not affected, and GHG continues to be captured. If maintenance or warranty service is required, AgCert shall contact the appropriate service provider. Upon restoration of the system the farm manager shall notify the Regional Maintenance Technician (RMT) (phone, e-mail, etc.).

**Anaerobic Digester**

| |
|---|
| **WARNING** |
| **The gas contained in the digester cell is EXTREMELY flammable.** |
| **Sources of ignition and smoking are not permitted within 10 meters of the cell and gas handling system.** |
| **Death or serious injury may result.** |

Training

Training on the Anaerobic Digester shall be provided to production operations personnel by the system manufacturer and installer. Training shall include: system components, start-up procedures, normal operation, emergency operations, maintenance, and request for service. Training on reporting procedures shall be provided to the productions operations personnel by AgCert.

Startup Procedures

Refer to the guide / manual for the anaerobic digester.

Loading Rate and Total Solids Content

Refer to the guide / manual for the anaerobic digester.

Normal Operation

Refer to the guide / manual for the anaerobic digester.

Safety Issues and Emergency Preparedness

- No open flame permitted within 10 meters of the digester
- Do not allow personnel to stand, sit, or lean against the digester cover
- Do not use sharp objects/tools in the vicinity of the cover

Weekly Inspection

A weekly inspection shall include the following:

- Cover material – check for cracks, tears, or points of distress around perimeter of digester cell.
- Check for excessive ballooning of cover or presence of odor
- Check seams for signs of gas leakage

Alternative Operating Procedures

In the event the digester cell becomes unusable, the farm manager shall notify AgCert in accordance with Emergency Maintenance section of this annex.. Both parties shall work together to reach an acceptable alternate method to treat the effluent so that farm operations are not affected, and GHG gas continues to be captured. If maintenance or warranty service is required, AgCert shall contact the appropriate service provider. Upon restoration of the system the Regional Maintenance Technician shall be notified (phone, e-mail, etc.).

**Biogas Transfer System and Biogas Sensor/Flow-Meter**

Training

Training on the Biogas Transfer System shall be provided to the operations personnel by the system manufacturer and installer. Training shall include: system components, normal operation, emergency operations, maintenance, and request for warranty service. Training on reporting procedures shall be provided to the production operations personnel by AgCert.

**Figure 2. Roots biogas flowmeter**

Normal Operation

Biogas produced in the anaerobic digester is trapped under a positive or negative pressure geomembrane cover installed over the digester cell. The biogas is routed from the digester to the flare via PVC tubing. A flow meter, which measures gas flow, is fitted in the biogas transfer system piping.

Safety Issues and Emergency Preparedness

Gas to the metering system should be disconnected prior to performing maintenance on the flow-meter. Care should be taken when digging in the area where the pipeline is buried.

Preventive Maintenance

Preventive maintenance shall be conducted in accordance with manufacturer's recommendations. NOTE: A record of the cumulative biogas reading must be recorded prior to zeroing the meter.

Weekly Inspection

The weekly inspection shall include the following:

- Check for leaks in exposed pipelines
- Check for proper operation of the flow-meter

Alternative Operating Procedures

In the event that the biogas transfer system becomes unusable; the farm manager shall **immediately** notify AgCert in accordance with the Emergency Maintenance section of this annex.. Both parties shall work together to reach an acceptable alternate method to route the biogas so that farm operations are not affected and GHG gas emissions are mitigated. If maintenance or warranty service is required, AgCert shall contact the appropriate service provider. Upon restoration of the system the RMT shall be notified (phone, e-mail, etc.).

**Combustion System (Flare)**

Training

Training on the Flare Combustion System shall be provided by the system manufacturer and installer. Training shall include: system components, normal operation, emergency operations, maintenance, and request for warranty service. Training on reporting procedures shall be provided to the production operations personnel by AgCert.

Normal Operation

The flare system is designed to combust the biogas whenever it is present. AgCert's flaring combustion system is automated to ensure that all biogas that exits the digester and passes through the flare (and flow meter) is combusted. Pressure control devices within the gas handling system maintain proper biogas flow to the combustion system. A continuous ignition system ensures methane combustion whenever biogas is present at the flare. The continuous ignition system is powered by a robust solar module (solar-charged battery system) that operates independently from the power grid. These solar modules are designed for rigorous outdoor application in remote locations and are proven through many years of operational experience in ranch and farm settings similar to AgCert project sites. Two (2) sparking electrodes provide operational redundancy to ensure that a minimum of one (1) spark is produced at the flare burner every 3 seconds. If biogas is present in the flare, it is immediately ignited by the sparking system. If biogas is not present, the igniter sparks harmlessly.

Safety Issues and Emergency Preparedness

Prior to performing any maintenance on the flare system, the gas flow **must** be turned off. Care should be exercised when working around the flare system as components can be extremely hot.

Preventive Maintenance

Preventive maintenance shall be conducted at least yearly.

Weekly Inspection

The weekly inspection shall include a visual inspection to determine the flare is combusting gas.

- If no flame is visible, check to see if there is a heat signature or if the flare assembly itself is hot. Night time inspection should reveal a visible light from the unit.

Alternative Operating Procedures

In the event that the flare system becomes unusable, the farm manager shall **immediately** notify AgCert in accordance with the Emergency Maintenance section of this annex. Both parties shall work together to reach an acceptable alternate method to combust the biogas so that farm operations are not affected and GHG emissions are mitigated. If maintenance or warranty service is required, AgCert shall contact the appropriate service provider. Upon restoration of the system the RMT shall be notified (phone, e-mail, etc.).

**Optional Combustion System**

If optional combustion equipment is installed during the project crediting period, the project developer will submit a change to the registered monitoring plan as required by the UNFCCC Secretariat.

Training

Training on any optional combustion system, e.g., generator, space heater, etc., shall be provided by the system manufacturer and installer. Training shall include: system components, normal operation, emergency operations, maintenance, and request for warranty service. Training on reporting procedures shall be provided to the production operations personnel by AgCert.

Normal Operation

An optional combustion system is designed to take advantage of the biogas and convert it into renewable energy. The systems can be used to generate electricity, heat a barn, or any other process approved (in writing) by AgCert and the verifying designated operational entity (DOE).

Safety Issues and Emergency Preparedness

Prior to performing any maintenance on an optional combustion system, the gas flow **must** be turned off. Care should be exercised when working around the optional combustion system as components can be extremely hot and high voltage may be present (when operating).

Preventive Maintenance

Preventive maintenance shall be conducted in accordance with manufacturer's recommendations. NOTE: In any case where it is required to zero and/or remove a meter, ensure that the meter reading is noted prior to zeroing and/or removing the meter.

Alternative Operating Procedures

In the event that the generator system becomes unusable, the user shall notify AgCert in accordance with the Emergency Maintenance section of this annex. The flare shall be used as the only method to combust GHG biogas. The user shall take appropriate action to notify his service provider should maintenance or warranty service be required. Upon restoration of the system the RMT shall be notified (phone, e-mail, etc.).

**Maintenance, Trouble Reporting and Documentation**

Emergency Maintenance:

Situations requiring immediate attention due to failure of components of the digester or combustion system that could cause significant damage to the physical structure, or could result in the release of GHG or failure to capture GHG should be immediately reported to the Regional Maintenance Technician. If unavailable, contact the National Monitoring or Maintenance Manager of the country where the equipment is located or the International Operations and Maintenance Manager.

| Title | Phone | e-mail |
|---|---|---|
| Regional Maintenance Technician (RMT) | Supplied during training | Supplied during training |
| Argentina National Monitoring Manager | (54) 348-844-6127 | operationsar@agcert.com |
| Brazil National Monitoring Manager | (55) 212-704-50 ext 0490 | operationsbr@agcert.com |
| Chile National Monitoring Manager | (56) 222-911-52 | operationscl@agcert.com |
| International Monitoring Manager | (001) 321-409-7846 | operations@agcert.com |
| Mexico National Monitoring Manager | (52) 552-122-0310 | operationsmx@agcert.com |
| Canada National Monitoring Manager | (001) 780-409-9286 | n/a |

Unscheduled Maintenance:

Situations requiring maintenance (not resulting in the release or failure to capture GHG) should be reported to the Regional Maintenance Technician, normally within 1 to 24 hours of discovery.

Records Keeping

Maintenance and servicing of equipment shall be recorded.

**MONITORING ACTIVITES**

The following table summarizes key parameters monitored:

**Table 1. Key parameters monitored**

| ID | Item | Applies to Project | Monitored | | ER Calculation Data | | Performed by | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | Ex-ante | Ex-post | Primary | Secondary | | |
| 1 | Sludge Removal (SlR) | ✓ | | ✓ | | | RMT | Ensures proper disposition of sludge |
| 2 | Biogas Produced (BGP) | ✓ | | ✓ | | ✓ | FH, RMT | QA/QC |
| 3 | Methane Content (MC) | ✓ | | ✓ | | ✓ | RMT | QA/QC |
| 4 | Combustion System Operational Time (CEE) | ✓ | | ✓ | ✓ | | FH, RMT | Whenever the flare is observed to be out of service, any biogas metered from the last known operational point in time, shall be deducted from the total Biogas reading |
| 5 | Efficiency of Flare process (EFP) | ✓ | | ✓ | | | EN | Ensures correct performance of combustion |
| Farm: FH – Farm Hand; DP – Data Processor; FM – Farm Manager;<br>AgCert: RMT – Regional Maintenance Technician, QA – Quality Assurance; OP – Operations, EN - Engineer | | | | | | | | |

## MONITORING WORK INSTRUCTIONS

Work instructions for the monitoring of key parameters can be found on the following pages:

### Work Instruction for monitoring ID 1, Sludge Removal$_r$

Summary

Due to the physical characteristics of the manure, it becomes necessary at times to remove the sludge that has accumulated inside a biodigester. This helps ensure the digester system is operating nominally. It is important to ensure the removed sludge is disposed of properly.

This ID monitors the number of times sludge is removed from the digestor and ensures the sludge is disposed of properly.

References

- AgCert Preventive Maintenance Instruction GM001, Biodigestor Sludge, Removal and Disposal Instruction
- UNFCCC approved monitoring methodology: AMS-III.D, Ver 10., Methane Recovery.

Prerequisite(s)

Processes

- I036-9, Bio-security and Safety

Training of Monitoring Personnel

- Regional Monitoring Technicians shall be trained on data collection transfer processes.
- Operations personnel shall be trained on proper disposition practices.

Equipment, Materials and Tools

- GM001, Biodigester Sludge Removal and Disposal Instruction
- GM001-F1, Sludge removal record

Calibration

- None

Process

| Step | Operator | Activity | Documentation | Comments |
|---|---|---|---|---|
| 1 | RMT | Determine need to remove sludge | | Sludge is disposed of by applying to soil or some other aerobic process |
| 2 | RMT | Coordinate with Maintenance to schedule sludge removal | Electronic | |
| 3 | M | Performs sludge removal in accordance with the PMI | | |
| 4 | M | Properly dispose of sludge | | |
| 5 | M | Document disposal method on maintenance form | Paper/electronic | |
| Farm: FH – Farm Hand; DP – Data Processor; FM – Farm Manager;<br>AgCert: RMT – Regional Maintenance Technician, QA – Quality Assurance; OP – Operations, EN – Engineer, M - Maintenance | | | | |

Record Control

| RECORD ID | RECORD LOCATION | RETENTION TIME | DISPOSITION |
|---|---|---|---|
| GM001-F1 | EnviroCert | Duration of project +2 years | Destroy |

**Work Instruction for monitoring ID 2, Biogas Produced**

Summary

This ID monitors the volume and flow of biogas sent to the combustion system on a monthly basis. It is a quality control check to ensure proper operation of the anaerobic digester.

References

- UNFCC approved monitoring methodology: AMS-III.D., Methane Recovery.
- Data collection forms (provided by farm manager)
- P025, Control of Monitoring and Measuring Device (MMD)
- MS004-F2, O & M Monthly Monitoring Form

Prerequisite(s)

Processes

- I036-9, Bio-security and Safety

Training of Monitoring Personnel

- Regional Maintenance Technicians and operations personnel shall be trained on data collection transfer processes.

Equipment, Materials and Tools

- Biogas Flow Meter

Calibration

- Prior to using a measuring device, ensure it is calibrated.

Process

| Step | Operator | Activity | Documentation | Comments |
|---|---|---|---|---|
| 1 | RMT | Record reading in appropriate area of MS004-F2, Monthly Monitoring Form | MS004-F2, Monthly Monitoring Form | |
| 2 | RMT | Transmit data to MLB operations | Fax, Electronic, etc | Enter data into EnviroCert |
| 3 | QA | Perform Quality Control Check for format, integrity, etc. | | |
| 4 | OP | Confirm reading within expected limits IAW manufacturer guidelines. | | |
| 5 | OP | Store Data | | |
| Farm: FH – Farm Hand; DP – Data Processor; FM – Farm Manager;<br>AgCert: RMT – Regional Monitoring Technician, QA – Quality Assurance; OP – Operations, EN – Engineer | | | | |

Record Control

| RECORD ID | RECORD LOCATION | RETENTION TIME | DISPOSITION |
|---|---|---|---|
| MS004-F2, Monthly Monitoring Form | Document Control Center | Duration of project + 2 years | Destroy |

**Work Instruction for monitoring ID 3, Methane Content**

Summary

This ID determines the methane content of the biogas. It is a snapshot of the AMWS methane production efficiency. Methane concentration is determined with a gas analyzer. The measuring equipment is calibrated in accordance with the manufacturer specifications.

References

- UNFCCC approved monitoring methodology: AMS-III.D., Methane Recovery
- P025, Control of Monitoring and Measuring Device (MMD)
- Operations Manual Gas Analyzer
- DM001-F2, Monthly Monitoring Form
- MS004-F3 or F4, O & M Maintenance Log

Prerequisite(s)

Processes

- I036-9, Bio-security and Safety

Training of Monitoring Personnel

- Operating the Gas Analyzer
- Regional Maintenance Technicians shall be trained on data collection transfer processes.
- Operations personnel shall be trained on data processing and storage

Equipment, Materials and Tools

- Gas Analyzer

Calibration

- As required by the manufacturer.

Process

| Step | Operator | Activity | Documentation | Comments |
|---|---|---|---|---|
| 1 | RMT | Prepare the gas analyzer as directed in the operator manual. | Gas Analyzer Operations Manual | |
| 2 | RMT | Connect the Gas analyzer to the system test port. | | |
| 3 | RMT | Open valve on test port | | |
| 4 | RMT | Take gas reading in accordance with Operations Manual | | Take 5 readings and average the results. |
| 5 | RMT | Record Gas readings in appropriate spaces of DM001-F2, Monthly Monitoring Form | DM001-F2, Monthly Monitoring Form | If there is greater than 10% points difference from previous reading, initiate appropriate maintenance actions and continue to measure on a monthly basis until the readings stabilize. |
| 6 | RMT | Close valve on test port | | |
| 7 | RMT | Disconnect hose in reverse order of connection | | |
| 8 | RMT | Double check that biogas test port valve is closed prior to leaving area | | |
| 9 | RMT | Transmit data in-country operations | Fax, Electronic, etc | Enter into EnviroCert |
| 10 | QA | Perform Quality Control Check for format, integrity, etc. | | |
| 11 | OP | Confirm reading within expected limits IAW manufacturer guidelines. | | |
| 12 | OP | Store Data | | |

| Step | Operator | Activity | Documentation | Comments |
|---|---|---|---|---|
| Farm: FH – Farm Hand; DP – Data Processor; FM – Farm Manager;<br>AgCert: RMT – Regional Monitoring Technician, QA – Quality Assurance; OP – Operations, EN - Engineer | | | | |

Records Control

| RECORD ID | RECORD LOCATION | RETENTION TIME | DISPOSITION |
|---|---|---|---|
| DM001-F2, Monthly Monitoring Form | Document Control Center | Duration of project + 2 years | Destroy |

**Work Instruction for monitoring ID 4, Fraction of Time Combustion Equipment Operates**

Summary

This parameter is used to determine the fraction of time in which gas is combusted. The fraction of time will be determined as 100% less any time the flare is out of service and gas is flowing. Flare maintenance records will be used to make this determination.

References

- UNFCC approved monitoring methodology: AMS-III.D., Methane Recovery
- MS004-F2, O & M Monthly Monitoring Form
- P025, Control of Monitoring and Measuring Device (MMD)

Prerequisite(s)

Processes

- I036-9, Bio-security and Safety

Training of Monitoring Personnel

- Regional Maintenance Technicians and operations personnel shall be trained on data collection transfer processes.

Equipment, Materials and Tools

- None

Calibration

- Prior to using a measuring device, ensure it is calibrated.

Process

| Step | Operator | Activity | Documentation | Comments |
|---|---|---|---|---|
| 1 | RMT | Record reading in appropriate area of MS004-F2, Monthly Monitoring Form | MS004-F2, Monthly Monitoring Form | |
| 2 | RMT | Transmit data to MLB operations | Fax, Electronic, etc | Enter data into EnviroCert |

| Step | Operator | Activity | Documentation | Comments |
|---|---|---|---|---|
| 3 | QA | Perform Quality Control Check for format, integrity, etc. | | |
| 4 | OP | Confirm reading within expected limits IAW manufacturer guidelines. | | |
| 5 | OP | Store Data | | |
| Farm: FH – Farm Hand; DP – Data Processor; FM – Farm Manager; AgCert: RMT – Regional Maintenance Technician; QA – Quality Assurance; OP – Operations, EN - Engineer | | | | |

Record Control

| RECORD ID | RECORD LOCATION | RETENTION TIME | DISPOSITION |
|---|---|---|---|
| MS004-F2, Monthly Monitoring Form | Document Control Center | Duration of project + 2 years | Destroy |

**Work Instruction for monitoring ID 5, Flare Efficiency**

Summary

This parameter guarantees the correct performance of digester and gas recovery.

References

- Approved monitoring methodology: AMS-III.D., Methane Recovery.
- P025, Control of Monitoring and Measuring Devices
- MS004-F2, O & M Monthly Monitoring Form
- OM002,  Flare Efficiency Test Instruction
- OM002-F1, Flare Efficiency Test Table

Prerequisite(s)

Processes

Efficiency is tested prior to installation and amount of methane combusted is calculated based on the efficiency rating.  According to the methodology, the flare efficiency shall be calculated as fraction of time the gas is combusted in the flare multiplied by the efficiency of the flaring process.

The enclosed-flaring combustion system is automated to ensure that all biogas that exits the digester and passes through the flare (and flow meter) is combusted.  Pressure control devices within the gas handling system maintain proper biogas flow to the combustion system. A continuous ignition system ensures methane combustion whenever biogas is present at the flare.  Two (2) sparking electrodes provide operational redundancy.  If biogas is present in the flare, it is immediately ignited by the sparking system.  If biogas is not present, the igniter sparks harmlessly.  This continuous ignition system is powered by a robust solar module (solar-charged battery system) that operates independently from the power grid.  The component parts are tested and verified functional on a periodic basis in accordance with manufacturer and other technical specifications.

A flare efficiency test will be performed for each new flare that is installed at an AgCert digester project

site. Initial flare efficiency testing will be performed by trained personnel using calibrated equipment and a third-party verified test protocol. Both methane destruction determinations described in the flare efficiency testing protocol will be performed during the initial flare testing to ensure that the flare performs according to specifications. Results of the initial flare efficiency test will be kept on project file and will be made available to the verifying Designated Operational Entity (DOE). Subsequent operational testing shall be accomplished at least yearly using the verified test protocol.

Equipment, Materials and Tools

- Gas analyzer (a Landtec GA-90, GEM-500 or equivalent).

Calibration

- Prior to using a measuring device, ensure it is calibrated.

Process

| Step | Operator | Activity | Documentation | Comments |
|---|---|---|---|---|
| 1 | EN | Perform procedures outlined in OM002. | OM002-F1, Flare Efficiency Test Table | |
| Farm: FH – Farm Hand; DP – Data Processor; FM – Farm Manager;<br>AgCert: RMT – Regional Monitoring Technician, QA – Quality Assurance; OP – Operations, EN - Engineer | | | | |

Record Control

| RECORD ID | RECORD LOCATION | RETENTION TIME | DISPOSITION |
|---|---|---|---|
| OM002-F1, Flare Efficiency Test Table | EnviroCert | Duration of Project +2 years | Destroy |