CLEAN DEVELOPMENT MECHANISM

AMS-III.Y.

Small-scale methodology

Methane avoidance through separation of solids from wastewater or manure treatment systems

Version 04.0

Sectoral scope(s): 13

United Nations
Framework Convention on
Climate Change

TABLE OF CONTENTS **Page**

1. Introduction

1. The following table describes the key elements of the methodology.

Table 1. Methodology key elements

Typical projects	Avoidance or reduction of methane production from anaerobic wastewater treatments systems and anaerobic manure management systems where the volatile solids are removed and the separated solids are further treated/used/disposed to result in lower methane emissions
Type of GHG emissions mitigation action	GHG emission avoidance: Avoidance of methane emissions

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology comprises technologies and measures that avoid or reduce methane production from anaerobic wastewater treatment systems [1] and anaerobic manure management systems, [2] through removal of (volatile) solids from the wastewater or manure slurry stream. The separated solids shall be further treated, used or disposed in a manner resulting in lower methane emissions.

3. The project activity does not recover and combust biogas i.e. the baseline wastewater or manure treatment plant as well as the project system are not equipped with methane recovery system. Project activities which recover and combust biogas from manure management systems shall consider AMS-III.D or AMS-III.R. Project activities which recover and combust biogas from wastewater treatment systems shall consider AMS-III.H. Project activities that substitute anaerobic wastewater treatment systems with aerobic wastewater treatment system shall consider AMS-III.I.

4. The technology for solids separation shall be one of the below or a combinations thereof so as to achieve a minimum dry matter content of separated solids larger than 20% [3]:

   (a) A pre-separation phase of chemical treatment by mixing flocculants with the wastewater, adopted to improve the efficiency of the subsequent mechanical solid-liquid separation process;

   (b) Mechanical solid/liquid separation technologies (e.g. stationary, vibrating or rotating screens, centrifuges, hydrocyclones, press systems/screws), operated in-

[1] As defined in 2006 IPCC Guidelines for National Greenhouse Gas inventories, Volume 5, Chapter 6, Wastewater treatment and discharge, table 6.3 and 6.8.

[2] As defined in 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10, Emissions from livestock and manure management, Table 10.18, “Definitions of Manure Management Systems”.

[3] Refer to section 10.4.3 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10, Emissions from livestock and manure management.

line with the inflowing freshly generated wastewater or slurry manure stream so as to avoid stagnation;

(c) Thermal treatment technologies that evaporate water content from the waste stream, either releasing vapour to the atmosphere or condensing it into a liquid fraction (condensate). Examples include evaporation and spray drying technologies.[4]

5. The dry matter content of separated solids shall remain higher than 20% throughout until its final disposal, destruction or use (e.g. spreading on the soil). The total time interval for the separation process until 20% dry matter content is achieved shall be less than 24 hours.

6. Separation of solids using gravity (settling tanks/basins, ponds, or geotextile containers/bags) is not included in this methodology.

2.2. Applicability

7. In case of animal manure management systems the following conditions apply:

(a) Animals shall be managed in confined conditions;

(b) If organic bedding material is used in the animal barns or added to the manure stream, separated solids shall not be reused in the barns;

(c) If the baseline manure slurry was treated in an anaerobic lagoon or another liquid treatment system, the outflow liquid from the lagoon was recycled as flush water or used to irrigate fields; however it was not discharged into river/lake/sea. In the latter case, i.e. effluent discharge into river/lake/sea, the system is considered as a wastewater treatment system and not a manure management system;

(d) A minimum interval of six months was observed between each removal of the solids accumulated in the lagoon.

8. In case of wastewater treatment systems the following conditions apply:

(a) The baseline treatment systems do not include a fine solids separation process (i.e. grading smaller than 10 mm aperture, primary settlers, mechanical separation, etc.);[5]

(b) In case the baseline treatment system was an anaerobic lagoon or a liquid system, a minimum interval of 30 days was observed between each removal of the solids accumulated in the lagoon.

[4] Spray drying is a method of drying a liquid feed through a hot gas. A micro spray is produced in the turbulence zone of hot air, which evaporates the solvent.

[5] This is to exclude the situation where in the absence of the project activity, the COD content of the solids separated in baseline would not have decayed in the wastewater treatment system, but in a solid waste disposal site or in any other solid waste management system. However, it shall be distinguished from the situation where certain solid separation equipment are used in the baseline to serve as a necessary/standard step in the industrial and manufacturing process, and continue to be used during the project activity. For example, filter press is commonly used in alcohol industry to recover the fine solids with an economic value. In such a case, this provision will not apply, because only the effluent after passing the filter press will be considered as wastewater.

9. This methodology is not applicable when the project treats solids removed from an existing lagoon, or sludge originated from settlers or from any other biologically active treatment device of the baseline animal manure management/wastewater treatment system.

10. The separated solids shall be further treated and methane emissions resulting from further treatment, storage, use or disposal shall be considered. If the solids are combusted for thermal or heat generation, that component of the project activity can use a corresponding methodology under Type I. If the solids are mechanically/thermally treated to produce refuse-derived fuel (RDF) or stabilized biomass (SB) the relevant provisions in AMS-III.E shall be followed. If the solids are used as animal feeds (e.g. feed to cows, pigs), emissions from enteric fermentation and emissions from the manure may be neglected.

11. The liquid fraction from the project solid separation system shall be treated either in the baseline treatment facility or in a treatment system with a lower methane conversion factor (MCF) than the baseline system.

12. This methodology applies to situations where the baseline treatment systems have been operational at least three years before the start date of the project activity. New facilities (Greenfield projects) and project activities involving a change of equipment resulting in an efficiency improvement or capacity addition of the wastewater or sludge treatment system compared to the designed capacity of the baseline treatment system are only eligible to apply this methodology if they comply with the requirements in the "General Guidelines to SSC CDM methodologies" concerning these topics. In addition, the requirements for demonstration of the remaining lifetime of the equipment replaced as described in the general guidelines shall be followed.

13. In case flocculants is used in the project activities, project emissions and leakage from use of flocculants should be taken into account.

14. Measures are limited to those that result in emission reductions of less than or equal to 60 Kt CO_2 equivalent annually.

2.3. Entry into force

15. The date of entry into force is the date of the publication of the EB 92 meeting report on the 4 November 2016.

2.4. Applicability of sectoral scopes

16. For validation and verification of CDM projects and programme of activities by a designated operational entity (DOE) using this methodology, application of sectoral scope 13 is mandatory.

3. Normative references

17. Project participants shall take into account the general guidance to the small-scale (SSC) clean development mechanism (CDM) methodologies and the Tool for demonstration of additionality of SSC project activities available at <http://cdm.unfccc.int/Reference/index.html>.

18. This methodology also refers to the latest approved versions of the following methodologies:

    (a) "AMS-I.D: Grid connected renewable electricity generation";

    (b) "AMS-III.D: Methane recovery in animal manure management systems";

    (c) "AMS-III.E: Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment";

    (d) "AMS-III.F: Avoidance of methane emissions through composting";

    (e) "AMS-III.G: Landfill methane recovery";

    (f) "AMS-III.H: Methane recovery in wastewater treatment";

    (g) "AMS-III.I: Avoidance of methane production in wastewater treatment through replacement of anaerobic systems by aerobic systems";

    (h) "AMS-III.R: Methane recovery in agricultural activities at household/small farm level".

4. Definitions

19. The definitions contained in the Glossary of CDM terms shall apply.

5. Baseline methodology

5.1. Project Boundary

20. The project boundary is the physical, geographical site:

    (a) Where the animal waste would have been collected, stored and treated and the methane emission would have occurred in the absence of the proposed project activity;

    (b) Where the wastewater treatment would have taken place and the methane emission would have occurred in the absence of the proposed project activity;

    (c) Where the treatment of animal waste or wastewater through solids separation takes place;

    (d) Where the storage, gainful use, destruction and/or land application of the separated solids takes place;

    (e) The itineraries between them, where the transportation of separated solids occur.

5.2. Baseline

21. The baseline scenario is the situation where the solids separated from manure stream or from the wastewater would be treated in the wastewater treatment or manure management system within the project boundary, without methane recovery, and methane is emitted to the atmosphere.

22. In the determination of baseline emissions, historical records of at least one year prior to the project implementation shall be used.[6] In case one year of historical data is not available or for capacity addition or Greenfield project, the parameters shall be determined by following the relevant procedures provided in AMS-III.H.

23. In the case of manure stream, where the barns do not use any organic bedding materials, baseline emissions shall be calculated based on the total mass of the volatile solids separated as below:

$$BE_y = \left(B_{o,w,y} \times M_{ss,y} \times VS_{ss,y} \times UF_b \times GWP_{CH4} \times D_{CH4}/1000\right) \times \sum_i \left(MS_{Bl,i} \times MCF_{b,i}\right) \quad \text{Equation (1)}$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2e)
$B_{o,w,y}$	=	Weighted methane-producing potential of the volatile solids separated by the project in year *y* (m^3 CH_4 per kg of VS)
$M_{ss,y}$	=	Mass (dry matter basis) of total separated solids in year *y* (kg)
$VS_{ss,y}$	=	Volatile solids content of the separated solids in year *y* on a dry matter basis (kg/kg)
UF_b	=	Model correction factor to account for model uncertainties (0.94)[7]
GWP_{CH4}	=	Global Warming Potential of methane applicable to the crediting period (t CO2e/t CH4)
D_{CH4}	=	Conversion factor of m^3 CH_4 to kilograms (0.67 kg per m^3 at 20°C and 1 atm pressure)
i	=	Index for baseline anaerobic manure management system
$MS_{Bl,i}$	=	Fraction of manure handled in the baseline anaerobic manure management system *i* (fraction, mass basis), based on historical information from previous year(s) before project. If historical information is not available, the capacity (tonne/day) of each baseline management system shall be verified before the project start. During the project, it would be assumed that the management systems with lower MCFs would be used up to their full capacity, and only thereafter the systems with larger MCF would be used. The value of $MS_{Bl,i}$ is '1.0' if only one type of treatment system was used in the baseline
$MCF_{b,i}$	=	Methane conversion factor for the baseline anaerobic manure management system *i* as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10

[6] In case of wastewater, it may include COD removal efficiency of the wastewater treatment systems, amount of dry matter in sludge, amount of final sludge generated per tonne of COD treated, power and electricity consumption per m^3 of wastewater treated and all other parameters required for determination of baseline emissions.

[7] Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

24. When organic bedding material is used in the animal barns or added to the manure stream, baseline emissions shall be calculated as follows:

$$BE_y = \left(B_{o,w,y} \times \sum_{LT}\left(N_{LT,y} \times VS_{LT,y} \times P_{LT,y} \times EFF_{SS,p,y}\right) \times UF_b \times GWP_{CH4} \times D_{CH4}/1000\right) \times \sum_i \left(MS_{Bl,i} \times MCF_{b,i}\right) \quad \text{Equation (2)}$$

Where:

LT	=	Index for livestock type
$N_{LT,y}$	=	Number of animals of livestock type LT for the year *y* (number)
$VS_{LT,y}$	=	Annual amount of volatile solids excreted by one animal of livestock type LT managed by the management system in year *y*, as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10 (kg per year of VS excreted by animal type LT)
$P_{LT,y}$	=	Average percent of manure from animal type LT that is delivered to the separation process (%) in year y
$EFF_{SS,p,y}$	=	Separation efficiency of the project solids/liquid separation system in removing solids from the influent manure stream (kg separated solids/kg influent solids) (dry matter basis)

25. The separation efficiency of the project separation system ($EFF_{SS,p,y}$) for mechanical separation technologies (paragraph 4(b) above) is determined at the time of commissioning (and annually thereafter) by simultaneous sampling and measurement of total solids content of the influent and effluent liquid streams, and calculated as below. For thermal separation technologies (paragraph 4(c)), where there is no liquid effluent and final separated product has the minimum 20% dry matter content, the efficiency of 100% may be assumed.

$$EFF_{ss,p,y} = \left(\%TS_{infl} - \%TS_{LEinfl}\right)/\left(\%TS_{infl}\right) \quad \text{Equation (3)}$$

Where:

$\%TS_{infl}$	=	Percent total solids of influent liquid stream (mass basis)
$\%TS_{LEinfl}$	=	Percent total solids of effluent liquid stream (mass basis)

26. The weighted methane-producing potential of the volatile solids separated from manure stream are calculated as follows:

$$B_{o,w,y} = \sum_{LT}\left(B_{0,LT} \times N_{LT,y} \times VS_{LT,y}\right) / \sum_{LT}\left(N_{LT,y} \times VS_{LT,y}\right) \quad \text{Equation (4)}$$

Where:

$B_{0,LT}$	=	Maximum methane-producing potential of manure generated by animal type LT, as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10 (m^3 CH_4 per kg of VS excreted by animal type LT)

27. In case of wastewater treatment systems, the baseline emissions BE_y, shall be determined as the minimum of the following two calculation:

$$BE_y = UF_b \times \left(Q_{y,ww,in} \times COD_{y,in} - Q_{y,ww,out} \times COD_{y,out}\right) \times B_{o,ww} \times MCF_{ww,treatment} \times GWP_{CH4}/1000 \quad \text{Equation (5)}$$

$$BE_y = UF_b \times Q_{y,ww,in} \times COD_{y,in} \times \eta_{COD,BL} \times B_{o,ww} \times MCF_{ww,treatment} \times GWP_{CH4}/1000 \quad \text{Equation (6)}$$

Where:

UF_b	=	Model correction factor to account for model uncertainties (0.89)[8]
$Q_{y,ww,in}$	=	Volume of wastewater entering the solid separation device in year *y* (m^3)
$COD_{y,in}$	=	Chemical oxygen demand of the wastewater entering the solid separation device (kg/m^3)
$Q_{y,ww,out}$	=	Volume of wastewater leaving the solid separation device in year *y* (m^3)
$COD_{y,out}$	=	Chemical oxygen demand of the wastewater leaving the solid separation device (kg/m^3)
$B_{o,ww}$	=	Methane producing capacity of the wastewater (IPCC default value of 0.25 kg CH_4/kg COD or 0.6 kg CH_4/kg BOD)
$MCF_{ww,treatment}$	=	Methane correction factor for the baseline anaerobic wastewater treatment system
$\eta_{COD,BL}$	=	COD removal efficiency of the baseline wastewater treatment system (%)

28. The Methane Correction Factor ($MCF_{ww,treatment}$) shall be determined as per the relevant procedure in AMS-III.H.

5.3. Project activity emissions

29. Project activity emissions consist of:

(a) Any methane emissions from storage, use, disposal or destruction of solids separated;

(b) Emissions from electricity and fossil fuel use by the solid separation technology as per the methods of AMS-I.D;

(c) Emissions from the combustion of flocculants used in the pre-separation phase;

(d) Incremental CO_2 emissions due to increased transportation ($PE_{y,transp}$):

(i) Transportation of solids to sites where it will be treated further or gainfully used (within the project boundary);

[8] Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

(ii) Transportation of solids from and to treatment facilities to storage sites (within the project boundary);

(iii) Transportation of solids to disposal site.

$$PE_y = PE_{y,ss} + PE_{y,power} + PE_{y,floc,combustion} + PE_{y,trans}$$ Equation (7)

Where:

$PE_{y,ss}$	=	Project emissions from storage, use, destruction or disposal of solids separated in year *y* (tCO_2e)
$PE_{y,power}$	=	Project emissions from energy use for operating the separation device in year *y* (tCO_2e), calculated as per AMS-I.D methods
$PE_{y,floc,combustion}$	=	Project emissions from combustion of flocculants in year *y* (tCO_2e)
$PE_{y,trans}$	=	Project emissions for incremental transportation of solids in the project scenario, beyond the emissions for transportation of solids in the baseline scenario (tCO_2e)

30. In case of manure management systems, project emissions from storage of separated solids are calculated as follows:

$$PE_{y,ss} = MCF_s \times UF_p \times B_{o,w} \times M_{ss,y} \times GWP_{CH4} \times D_{CH4}/1000$$ Equation (8)

Where:

MCF_s	=	Methane conversion factor for solid storage as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4, Chapter 10, Table 10.17.
UF_p	=	Model correction factor to account for uncertainties (1.06)[9]

31. In case of wastewater the amount of separated solids ($M_{ss,y}$, dry basis) will be used to calculate the project emissions for the treatment and disposal of the solids, using the procedures for sludge management, according to AMS-III.H, as follows:

$$PE_{y,ss} = \sum_j \left(PE_{y,s,treatment,j}\right) + PE_{y,s,final}$$ Equation (9)

Where:

j	=	Index for solids treatment system
$PE_{y,s,treatment,j}$	=	Methane emissions from solids treatment system *j* of the project activity, not equipped with biogas recovery, in year *y* (tCO_2e)

[9] Reference FCCC/SBSTA/2003/10/Add.2, page 25.

$PE_{y,s,final}$	=	Methane emissions from anaerobic decay of the final solids produced in the year *y*. If the solids are controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in aerobic conditions in the project activity, this term shall be neglected, and the solids treatment and/or use and/or final disposal shall be monitored during the crediting period (tCO_2e)

32. Methane emissions from solids treatment system *j* are determined using the methane generation potential of the solids considered as sludge:

$$PE_{y,s,treatment,j} = M_{ss,j,y} \times MCF_{s,treatment,j} \times DOC_s \times UF_{PJ} \times DOC_F \times F \times 16/12 \times GWP_{CH4}/1000 \quad \text{Equation (10)}$$

Where:

$M_{ss,j,y}$	=	Amount of dry matter in the solids treated by the treatment system *j* in year *y* (kg)
$MCF_{s,treatment,j}$	=	Methane correction factor for the solids treatment system *j* (MCF values as per table 2, AMS-III.H)
DOC_s	=	Degradable organic content of the solids generated in the year *y* (fraction, dry basis). Default values of 0.5 for solids separated from domestic wastewater and 0.257 for solids separated from industrial wastewater[10] shall be used
UF_{PJ}	=	Model correction factor to account for model uncertainties (1.06)
DOC_F	=	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	=	Fraction of CH_4 in biogas (IPCC default of 0.5)

33. Methane emissions from final disposal of solids separated from wastewater are determined as follows:

$$PE_{s,final,y} = M_{SS,final,y} \times DOC_s \times UF_{PJ} \times MCF_{s,final} \times DOC_F \times F \times 16/12 \times GWP_{CH4}/1000 \quad \text{Equation (11)}$$

Where:

$M_{SS,final,y}$	=	Amount of dry matter in the final solids delivered for final disposal in the year *y* (kg)
DOC_s	=	Degradable organic content of the final solids generated in the year *y* (fraction, dry basis). Default values of 0.5 for solids separated from domestic wastewater and 0.257 for solids separated from industrial wastewater shall be used
UF_{PJ}	=	Model correction factor to account for model uncertainties (1.06)

[10] The IPCC default values of 0.05 for domestic sludge (wet basis, considering a default dry matter content of 10 percent) or 0.09 for industrial sludge (wet basis, assuming dry matter content of 35 percent), were adopted, and corrected for dry basis.

$MCF_{s,final}$ = Methane correction factor of the disposal site that receives the final solids, estimated as per the procedures described in AMS-III.G

34. In case the solids separated from manure or from wastewater are composted, the methane emissions from composting of solids separated by the project activity ($PE_{s,composting,y}$) is determined as per the relevant procedure in AMS-III.F.

35. Project activity emissions from electricity or fossil fuel consumption ($PE_{y,power}$) are determined as per the procedures described in AMS-I.D. The energy consumption of all equipment/devices installed by the project activity, inter alia all equipment to separate solids (including energy used for spray drying and evaporation) shall be included. For project activity emissions from fossil fuel consumption the emission factor for the fossil fuel shall be used (tCO_2/tonne). Local values are to be used, if local values are difficult to obtain, IPCC default values may be used. If recovered methane is used to power auxiliary equipment of the project it should be taken into account accordingly, using zero as its emission factor.

36. In case of combustion of separated solids, the CO_2 emissions from the combustion of the non-biomass (i.e. fossil) carbon content of the flocculants shall be considered. In such a case, a default value of 0.2 tCO_2e per tonne of flocculants may be used.

37. Project activity emissions from trucks for incremental transport activities of solids shall be calculated as follows:

$$PE_{y,transp} = Q_{y,transp}/CT_y \times DT_y \times EF_{CO2} \quad \text{Equation (12)}$$

Where:

$Q_{y,transp}$ = Quantity of solids transported in year *y* (tonnes)

CT_y = Average truck capacity for transportation (tonnes/truck)

DT_y = Average incremental distance for transportation of separated solids (km/truck)

EF_{CO2} = CO_2 emission factor for the fuel used for transportation (tCO_2/km, IPCC default values or local values)

5.4. Leakage

38. If the solid separation technology is equipment transferred from another activity leakage effects are to be considered.

39. When flocculants is used and if the flocculants includes ingredients that were manufactured and not a waste product, then leakage emissions must be addressed for that portion of the flocculants. A default emission factor of 7.9 tCO_2e/t may be applied based on the amount of the flocculants that is manufactured (i.e. excluding the portions that obtained from waste sources).

5.5. Emission reductions

40. The emission reductions achieved by the project activity will be calculated as baseline emissions minus project emissions minus leakage.

$$ER_y = BE_y - PE_y - LE_y$$ Equation (13)

Where:

ER_y	=	Emission reductions during the year *y* (tCO_2)
BE_y	=	Baseline emissions during the year *y* (tCO_2)
PE_y	=	Project emissions during the year *y* (tCO_2)
LE_y	=	Leakage during the year *y* (tCO_2)

6. Monitoring methodology

41. Historical information confirming that the operational conditions of the baseline manure management or wastewater treatment system shall be validated:

    (a) The animals are managed in confined conditions, the overflow of the anaerobic lagoon is not discharged into river/lake/sea, and a minimum interval of 6 months between each consecutive solids removal operation;

    (b) The wastewater treatment system has no fine solids separation process, a minimum interval of 30 days between each consecutive settled solids removal operation;

    (c) Evidence of the minimum retention time of solids shall be provided through registers of the previous removal procedures, and/or checking for consistency the volume capacity of the lagoon/system, compared with the amount of solids expected to be accumulated during this time interval;

    (d) If more than one manure management system *i* were used in the baseline, the one-year historical information of the amount of manure managed in each system ($MS_{Bl,y,i}$);

    (e) COD removal efficiency of the baseline wastewater treatment system.

42. The following parameters shall be monitored and recorded during the crediting period using peer-reviewed methods.[11] Peer-reviewed methods and frequency of monitoring for each parameter shall be described in the project design document and shall assure the statistical confidence level required in the general guidelines for monitoring of small-scale project activities:

    (a) Mass of separated solids ($M_{ss,y}$), measured by direct weighing of all separated solids, and measuring its dry matter content through representative sampling. If the dry matter content of a sample is lower than the minimum value of 20%, no emission avoidance will be assigned to the amount of separated solids from which the sample is representative;

    (b) Amount of fossil fuel and/or electricity used to power separation equipment;

[11] Such as Standard Methods for the Examination of Water and Wastewater, 20th Edition (Clesceri, Greenberg, Eaton. 1998).

(c) In case of use of flocculants, amount of manufactured ingredients of flocculants used and the total amount of the flocculants used;

(d) Parameters related to transport: amount of solids transported, average transport capacity of trucks and average incremental distance ($Q_{y,transp}$, CT_y, DT_y);

(e) Leakage where applicable.

43. For manure management systems the following parameters shall be monitored as well:

(a) Number of animals of type LT expressed in numbers ($N_{LT,y}$), and their individual annual volatile solids excretion ($VS_{LT,y}$), which shall be determined following relevant procedure in AMS-III.D;

(b) Volatile solids content of the separated solids ($VS_{SS,y}$).

44. For wastewater treatment systems the following parameters shall be monitored as well:

(a) Flow of wastewater entering and leaving the solid separation device shall be monitored continuously to determine the annual volume ($Q_{y,ww,in}$, $Q_{y,ww,out}$);

(b) The COD load of the wastewater entering and leaving the solid separation device using peer reviewed methods and representative sampling to determine $COD_{y,in}$ and $COD_{y,out}$;

(c) For each treatment step "j" the amount treated ($M_{SS,j,y}$), for the final disposal the amount ($M_{SS,final,y}$) will be monitored. The characteristics of the disposal site (such as to confirm the applicable value for $MCF_{s,final}$) will be validated/verified by the DOE.

45. In case of composting of separated solids, relevant parameters for calculating the project emissions from the composting of the separated solids shall be monitored according to the relevant procedure in AMS-III.F.

46. The operation of the solids separation facilities will be documented in a quality control program, which shall monitor the conditions and procedures that ensure the consistent efficiency of solids removals efficiency within the separation process.

47. Additional parameters, where relevant, shall be monitored as indicated in the tables below. The applicable requirements specified in the "General Guidelines for SSC CDM methodologies" (e.g. calibration requirements and sampling requirements) are also an integral part of the monitoring guidelines specified below and therefore shall be referred by the project participants.

Data / Parameter table 1.

Data / Parameter:	$P_{LT,y}$
Data unit:	Percent
Description:	Average percent of manure from animal type LT that is delivered to the separation process (%) in year y
Source of data:	Configuration of manure management systems

Measurement procedures (if any):	Average percent of total number of animals by type confined in facilities from which manure is being sent through the separator. In the PDD, project proponents shall describe existing management system and provide a procedure to estimate the parameter.
Monitoring frequency:	Daily records of animal numbers by type.
QA/QC procedures:	Review of project records of electricity use by separation system to verify hours of operation are consistent with validated value of $P_{LT,y}$.
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	$EFF_{SS,p,y}$
Data unit:	Percent (kg separated solids/kg influent manure solids).
Description:	Separation efficiency of the project solids/liquid separation system in removing solids from the influent manure stream (kg separated solids/kg influent solids) (dry matter basis)
Source of data:	Testing by qualified personnel.
Measurement procedures (if any):	Determined at the time of commissioning (and annually thereafter) by a simultaneous sampling and lab analysis for total solids content of the influent manure and liquid effluent streams, and calculated as per equation (3). Accredited lab tests for total solids (%TSInfl) of influent, liquid effluent (%TSLeffl). Laboratories providing testing of manure samples must be accredited in accordance with ISO 17025:2005. Required on-site samples and measurements will be done in accordance with procedures set forth by the testing lab and will be designed to achieve an overall outcome with 90%/10% confidence/precision.
Monitoring frequency:	At commissioning of each project activity and annually thereafter.
QA/QC procedures:	Use of accredited testing service with internal QA/QC procedures. Annual re-testing separation efficiency confirms on-going performance of separator. Review for reasonableness by comparison to industry averages. An example reference for industry averages is “Mechanical Liquid-Solid Separation of Livestock Manure, A Literature Review” (Ford and Fleming, 2002).
Any comment:	

Data / Parameter table 3.

Data / Parameter:	$\%TS_{infl}$
Data unit:	Percent
Description:	Percent total solids of influent (mass basis)
Source of data:	Testing of influent manure samples by accredited testing service.
Measurement procedures (if any):	Sampling procedures per instructions from accredited testing service.
Monitoring frequency:	At commissioning of each project activity and annually thereafter.
QA/QC procedures:	Use of accredited testing service with internal QC/QA procedures.
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	$\%TS_{LEinfl}$
Data unit:	Percent
Description:	Percent total solids of effluent (mass basis)
Source of data:	Testing of effluent manure samples by accredited testing service.
Measurement procedures (if any):	Sampling procedures per instructions from accredited testing service.
Monitoring frequency:	At commissioning of each project activity and annually thereafter.
QA/QC procedures:	Use of accredited testing service with internal QC/QA procedures
Any comment:	-

6.1. Project activity under a programme of activities

48. The methodology is applicable to a programme of activities, no additional leakage estimations are necessary other than that indicated under leakage section above.

- - - - -

Document information

Version	*Date*	*Description*
04.0	4 November 2016	EB92, Annex 12 Revision to allow the use of organic bedding material in the project activity.
03.0	2 March 2012	EB 66, Annex 58 To provide more guidance on emissions from enteric fermentation, and from thermal treatment of wastewater.
02.0	16 October 2009	EB 50, Annex 28 The applicability conditions are expanded to allow the use of flocculants in the pre-separation phase to improve the subsequent mechanical solid-liquid separation efficiency.
01.0	28 November 2008	EB 44, Annex 18 Initial adoption.

Decision Class: Regulatory
Document Type: Standard
Business Function: Methodology
Keywords: animal manure management systems, avoidance of methane emission, simplified methodologies, solid waste, type (iii) projects, water