

	CDM: Response form for request for clarification on Approved Methodologies (version 01.1)
<i>Date of Meth Panel meeting:</i>	04 - 08 May 2009
<i>Title and number of request for clarification</i>	<p>Queries on application of AM0025 to projects using specific waste treatment technology w.r.t the issue of residual waste treatment, monitoring of anaerobic conditions and leakage from the digester</p> <p>AM_CLA_0144</p>
<u>Summary of the query:</u>	
Please use the space below to summarize the request for clarification on the related approved methodologies.	
<p>The request for clarification refers to AM0025 “Avoided emissions from organic waste through alternative waste treatment processes”.</p> <p>The project activity is setting up a municipal solid waste treatment facility using waste sorting technology to separate inert components for land filling, separating combustible material for use as RDF and to use controlled hybrid biological process to treat the biodegradable fraction of waste so that biogas and compost is obtained from the biodegradable component. The combustible fraction of MSW is mechanically separated and made into RDF for use as fuel. The inert fraction is also separated and dumped into landfill. The organic or biodegradable fraction is put into a vessel to generate biogas and compost. This hybrid technology uses a bioconversion process, which is a patented biological process converting organic content of MSW into compost and biogas which uses a Distributive Control System (DCS) to ensure optimum conditions during aerobic and anaerobic phases. Accompanying this request for clarification is a document “Technology_info.pdf” with back up information on the DiCOM technology outlined here. It is important to note the following when considering this information. The type of waste prevalent in India and indeed other developing countries is quite different from that in Australia (assumed in the technology info document). For this reason, DiCOM’s bio conversion technology will be used with a segregation technology, which is slightly different from that described in this pdf document, and will be required for waste composition in India.</p> <p>The 4-stage bioconversion process occurring in the same vessel involves:</p> <ol style="list-style-type: none"> (a) Aerobic processing – After organic fraction of MSW is mixed and pulverized it is loaded into a treatment vessel where it undergoes aerobic treatment for five days during the loading. The five days also involve daily loading of biodegradable fraction of MSW. (b) Anaerobic processing – After five days of loading and aerobic process the vessel’s phase is changed to anaerobic phase and regulated bacterial inoculum is introduced in the form of water solution. The anaerobic digestion process is carried out for 7 days during which biogas containing approx. 60% methane is generated due to anaerobic digestion of organic waste and this gas is used to generate electricity. (c) Secondary aerobic processing – After anaerobic processing, the water is drained from the vessel, air is reintroduced and secondary aerobic processing occurs to convert the material into compost for another 7 days. (d) Removal – Compost is removed over two days from the treatment vessel available for retail sale, or use in agriculture. Vessels and system are prepared for the next cycle. 	

The Bioconversion cycle occurs over a 21 day period and is managed by a fully-automated control system that constantly monitors and adjusts vessel conditions to deliver an optimal result. Aeration system is managed during the aerobic process by DCS that monitors the oxygen levels inside the vessel via an in-line gas analyzer that continuously samples the process inside the sealed vessel from 6-ports. The DCS activates the addition of air when oxygen levels fall below a predefined set-point.

Clarification is sought on how to correctly apply AM0025 in the following three aspects:

1. Treatment of emissions from composting as project emissions or leakage:

As per the methodology: “The methodology is applicable to project activity that involves one or a combination of the following waste treatment options for the fresh waste that in a given year would have otherwise been disposed of in a landfill:

- (a) A composting process in aerobic conditions;
- (b) Gasification to produce syngas and its use;
- (c) Anaerobic digestion with biogas collection and flaring and/or its use;
- (d) Mechanical/thermal treatment process to produce refuse-derived fuel (RDF)/stabilized biomass (SB) and its use.”

“In case of anaerobic digestion, gasification or RDF processing of waste, the residual waste from these processes is aerobically composted and/or delivered to a landfill”.

As mentioned above, a combination of different waste treatment options, RDF preparation, anaerobic digestion and aerobic composting is allowed under the methodology, and is in line with the proposed project (for this submission), whereby the project proponent will separate the combustible material (as RDF) and inert material (to land fill) and then carry out aerobic composting and anaerobic digestion in a single vessel under controlled conditions: The project proponent needs guidance on whether they should consider that:

- (1) They are treating fresh MSW by RDF processing, anaerobic digestion and composting without generating any residual waste;

OR

- (2) They are treating fresh waste primarily by RDF processing and residual waste from this process is treated by anaerobic digestion and composting.

Consideration of any of these two options does not have any impact on estimation of emission reductions but has an impact in the sense that in the first case we have to consider emissions from anaerobic digestion and composting as ‘project emissions’ whereas in the second case, as per methodology, we have to consider emissions from composting as ‘leakage emissions’. Given the process description, the first case is more applicable because emissions from anaerobic digestion and composting will be in the control of the project proponents and hence should be treated as ‘project emissions’ and not ‘leakage emissions’. It is essential to have this clarity from the perspective of correctly applying the methodology and distinguishing between project emissions and leakage.

2. Project Emissions

As per the methodology, “during the composting process, aerobic conditions are neither completely reached in all areas nor at all times. Pockets of anaerobic conditions – isolated areas in the composting heap where oxygen concentrations are so low that the biodegradation process turns anaerobic – may occur. The emission behaviour of such pockets is comparable to the anaerobic situation in a landfill. This is a potential emission source for methane similar to anaerobic conditions which occur in unmanaged landfills. Project methane emissions from composting are required to be calculated as follows:

$$PE_{c,CH_4,y} = MB_{compost,y} * GWP_{CH_4} * S_{a,y}$$

Where:

$PE_{c,CH_4,y}$ = Is the project methane emissions due to anaerobic conditions in the composting process in year y (tCO₂e)

$S_{a,y}$ = Is the share of the waste that degrades under anaerobic conditions in the composting plant during year y (%)

$MB_{compost,y}$ = Is the quantity of methane that would be produced in the landfill in the absence of the composting activity in year y (tCH₄). $MB_{compost,y}$ is estimated by multiplying MB_y (methane generation potential from entire fresh MSW) by the fraction of waste diverted, from the landfill, to the composting activity (f_c) relative to the total waste diverted from the landfill to all project activities (composting, gasification, anaerobic digestion and RDF/stabilized biomass, incineration)

GWP_{CH_4} = Is the Global Warming Potential of methane (tCO₂e/tCH₄)

Calculation of $S_{a,y}$

If oxygen content is below 5% - 7.5%, aerobic composting processes are replaced by anaerobic processes. To determine the oxygen content during the process, it is required to measure oxygen content according to a predetermined sampling scheme and frequency. These measurements should be undertaken for each year of the crediting period and recorded each year. The percentage of the measurements that show oxygen content below 10% is presumed to be equal to the share of waste that degrades under anaerobic conditions (i.e. that degrades as if it were landfilled) hence the emissions caused by this share are calculated as project emissions *ex post* on an annual basis:

$$S_{a,y} = S_{OD,y} / S_{total,y}$$

Where:

$S_{OD,y}$ = Is the number of samples per year with an oxygen deficiency (i.e. oxygen content below 10%)

$S_{total,y}$ = Is the total number of samples taken per year, where $S_{total,y}$ should be chosen in a manner that ensures the estimation of $S_{a,y}$ with 20% uncertainty at a 95% confidence level”

In the proposed bioconversion process, the aeration system is managed during the aerobic process by a Distributive Control System (DCS) that monitors the oxygen levels inside the vessel via an in-line gas analyzer that continuously samples the process inside the sealed vessel from 6-ports. The DCS activates the addition of air when oxygen levels fall below a predefined set-point. The odour control system has a separate gas analyzer that measures the CH₄ levels of the air coming from the vessel during aerobic composting. If CH₄ is greater than 1% then the gas is diverted to the flare and the CH₄ is combusted to CO₂. Can these highly accurate systems obviate the requirement to calculate project methane emissions ($PE_{c,CH_4,y}$) and associated monitoring requirements due to anaerobic conditions in the aerobic process because the process is designed to ensure aerobic conditions during the entire aerobic decomposition process? In case methane is released, it will be flared. In addition we would request to acknowledge that monitoring of anaerobic conditions under the aerobic process in the proposed bioconversion process would be only applicable during the first five days and next seven days of aerobic conditions (after seven days of anaerobic process) in the entire 21 day cycle when the process design is ensuring aerobic conditions during aerobic decomposition process. The last two days of the 21 day cycle are related to controlled extraction of compost so we would request to acknowledge that it can be assumed that no methane is generated during this short time period and it is not required to monitor anaerobic conditions during this period.

3. Emission from leakage from digester

According to AM0025, version 11, the emissions from anaerobic digestion should be accounted for in the following way:

“Emissions from anaerobic digestion ($PE_{a,y}$)

$$PE_{a,y} = PE_{a,l,y} + PE_{a,s,y}$$

Where:

$PE_{a,l,y}$ = Is the CH_4 leakage emissions from the anaerobic digesters in year y (tCO₂e)

$PE_{a,s,y}$ = Is the total emissions of N_2O and CH_4 from stacks of the anaerobic digestion process in year y (tCO₂e)

CH_4 Emissions from leakage ($PE_{a,l,y}$)

A potential source of project emissions is the physical leakage of CH_4 from the anaerobic digester. Three options are provided by methodology for quantifying these emissions, in the following preferential order:

Option 1: Monitoring the actual quantity of the gas leakage;

Option 2: Applying an appropriate IPCC physical leakage default factor, justifying the selection:

$$PE_{a,l,y} = P_1 * M_{a,y}$$

Where:

$PE_{a,l,y}$ = Is the leakage of methane emissions from the anaerobic digester in year y (tCO₂e)

P_1 = Is the physical leakage factor from a digester (fraction)

$M_{a,y}$ = Is the total quantity of methane produced by the digester in year y (tCO₂e)

Option 3: Applying a physical leakage factor of zero where advanced technology used by the project activity prevents any physical leakage. In such cases, the project proponent must provide the DOE with the details of the technology to prove that the zero leakage factor is justified”.

The methodology requires project proponents to adopt these options in preferential order mentioned above i.e. option 1 should be first preference. Project proponents would like to choose option 3, because there is no physical leakage since vessels used in bioconversion process are sealed pressure vessels built to the United States fuel storage code API 620. The vessels are pressure tested to 30kPA for gas and water leaks prior to commencement of operation. In this scenario do we need to justify why option 1 and option 2 are not preferred? Note the related revision made in ACM0014 during EB45 – see highlights at <http://cdm.unfccc.int/EB/045/eb45_repan12.pdf>.

Recommendation by the Meth Panel:

Please use the space below to provide amendments /changes (in your expert view, if necessary).

The Meth Panel clarifies that:

- (1) It should be considered that the fresh MSW is being treated by RDF processing, anaerobic digestion and composting without generating any residual waste. Therefore, emissions from anaerobic digestion and composting should be treated as project emissions;
- (2) From the description provided by the project proponents, it is understood that the share of the waste that degrades under anaerobic conditions from the composting process will be minimal, as oxygen levels will be continuously monitored, and air will be added in case those levels fall below a predefined set-point. It is also understood that if methane emissions are greater than 1%, then the gas is diverted to the flare and CH₄ is combusted to CO₂. A **revision to the methodology** would be required to include reference to the continuous monitoring of oxygen using the new system and addressing methane emissions from flaring the gases generated in the composting process;
- (3) Option 3 in the methodology for estimating emissions from physical leakage from the biodigester could be used as long as the project proponent provides the DOE details of the technology to prove that the zero leakage factor is justified.

Answer to authors of the request for clarification by the Meth Panel :

Please use the space below to provide an answer to the authors of the above query

Please refer above text.



Signature of Meth Panel Chair
Date: 08/05/2009 (Philip Gwage)



Signature of Meth Panel Vice-Chair
Date: 08/05/2009 (Pedro Martins Barata)

Information to be completed by the secretariat

F-CDM-AM	AM_CLA_0144
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