CDM: Response form for Request for revision of approved methodologies (version 01.1)

Date of Meth Panel meeting:	4 – 8 September, 2006
Title and number of Request for revision	AM_REV_0017: "Proposal to revise AM0028: Broadening the applicability to include caprolactam production process"

Summary of the query:

Please use the space below to summarize the request for revision on the related approved methodologies.

This is a request to expand the scope of approved methodology AM0028 to facilities whose end product is caprolactam, which is a chemical compound with a formula $C_6H_{11}NO$, which is made by reaction of cyclohexanone (C_6H_5O) with hydroxylamine (NH_2OH) to produce cyclohexanoxime (C_6H_5NOH), followed by rearrangement (Beckmann rearrangement) through presence of sulfuric acid into $C_6H_{11}NO$.

It is the preparation of hydroxylamine, which involves ammonia oxidation process (Raschig method). Therefore, caprolactam production process involves the same ammonia oxidation catalytic process as nitric acid. In view of this process, much of the proposed revision expands the term "nitric acid" with "nitric acid or caprolactam". Other change is to include energy consumed at the reheater as the source of project emissions.

Recommendation by the Meth Panel:

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

This methodology, along with AM0034 on secondary N_2O formation, should in principle apply to any product involving ammonia oxidation process. However, there are several differences between caprolactam and nitric acid.

- Caprolactam production is a more complex process involving several intermediate stages;
- Nitrogen source of caprolactam comes from both nitrogen oxide (oxidized ammonia) and ammonia fed after the ammonia oxidation process, though it is expected that it would not be possible to adjust the source of nitrogen;
- Caprolactam can be produced through methods which do not involve oxidation of ammonia (and thereby causing no N_2O emissions), though the most common process is Raschig method involving ammonia oxidation.

In view of the above, the following modifications to the revised edition are suggested.

- Existing caprolactam plants are limited to those employing the Raschig process not importing sources of nitrogen compounds other than feed ammonia from outside the project boundary. The suggested methodology states that "*In case the caprolactam production process utilizes non-Raschig process, the project participants shall demonstrate that the N_2O production mechanism for the process is equivalent to that of Raschig process*" But this is a rather vague statement open to potential misuse. Since the prevailing method of production is the Raschig process, it can be limited as such;
- Inclusion of "Switch to alternative production method not involving ammonia oxidation process" as an alternative to the project activity. For caprolactam, such methods are developed primarily as an attempt to reduce ammonium sulphate, an often unwanted byproduct of caprolactam, and could be a viable option;
- The default emission to be referred to when the plant is operating out of normal temperature and pressure range are defined according the IPCC guidelines, i.e. for nitric acid plants, the figure shall be 4.5kg N_2O /tonne of nitric acid (change from 4.05 kg N_2O /tonne of nitric acid in accordance with AM0034), whereas for caprolactam the figure shall be 5.4kg N_2O /tonne of caprolactam. The

proposed project activity estimates the emission factor for the intended project as around 8.5kg N_2O /tonne of caprolactam. Therefore it is inferred that such a default factor would be reasonably conservative.

(b) Please use the space below for providing guidance, as per Para 93 of EB25 Report, on what type of projects need to revise the PDD as a consequence of the suggested revision, if the recommendation is to revise the methodology.

The recommendation is to expand the scope of AM0028 to accommodate project activities destroying N2O produced in the process of caprolactam production. Therefore, the revision does not affect project activities destroying N_2O produced in the process of nitric acid production.

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

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

It is desirable to make the methodology as generic as possible without specific reference to a particular product such as nitric acid or caprolactam. However, most recent IPCC guidelines state that "Estimation of emissions of N_2O from caprolactam production can be treated as analogous to estimation of emissions of N_2O from nitric acid production. Both production processes involve an initial step of ammonia oxidation which is the source of N_2O formation and emissions."

Among the substances discussed in the guideline, caprolactam is the only substance to which the above apply (this does not apply to other substances such as adipic acid, glyoxal and glyoxylic acid). Therefore, it follows that caprolactam is listed in parallel to nitric acid. It is recommended that future revisions which involve expansion into other substances, if any, do not take this approach, and provide substances in an annex to which the methodology is applied, as well as its conditions.

Signature of the Meth Panel Chair ……..
Date: 13/09/2006 *(Rajesh Kumar Sethi)*

Signature of the Meth Panel Vice-Chair ……..
Date: 13/09/2006 *(Jean-Jacques Becker)*

Information to be completed by the secretariat	
F-CDM-AM	F-CDM-AM-REV-0017
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