

Interactive comment on “Mercury emission from crematories in Japan” by M. Takaoka et al.

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After I carefully coped with many points the referee indicated, I submitted the following author response sheet, the revised abstract and the revised manuscript to APCD on 4th December, 2009. Present discussion paper and abstract have been revised.

For 1st reviewer Question & Comments After going through the paper, following are the review comments for “Mercury Emission from Crematory in Japan” by Masekoameng et al. submitted for publication in Atmospheric Chemistry and Physics Journal. In summary, the data presented in the paper is interesting but paper is poorly presented and there are ample of places for improvement. However, based on the importance of Hg emission data from crematory, major revision is suggested before potential publication.

Response Thank you very much for your thoughtful comments. I would like to show each response for your questions & comments as follows.

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Some general comments Question & Comments 1. Manuscript contains sufficient spaces for grammatical corrections. Language and presentations must be improved before potential publication. Several sentences are unclear, confusing and not well presented. It is thus, strongly recommended to improve the presentation.

Response The English in my revised paper has been checked by at least two professional editors, both native speakers of English. For a certificate, please see: <http://www.textcheck.com/certificate/dyLwVM>

But, I modified the following part after the above check. “Because Hg0 was dominant in flue gas based on measurement results, there was a difference in the chemical form between the results of thermodynamics and measurements. It might be cleared by measurement in upstream flue gas before bag filter.”

Question & Comments 2. Proper wording must be used. Such as “per one” “per”; “big peak” “higher peak”. It is suggested to write paper in more scientific and technical language.

Response As you indicated, I corrected their words.

Question & Comments 3. The unit denotation $\mu\text{g}/\text{m}^3\text{N}$.presented in the paper is unclear. Please explain it in its first appearance. Is it normal cubic meter? If so, it's better to present as $\mu\text{g}/\text{Nm}^3$ rather than $\mu\text{g}/\text{m}^3\text{N}$.

Response As you indicated, I corrected the unit and explained it in its first appearance.

Question & Comments 4. Uniformity in using chemical name and formulae required, such as SnCl_2 is used first and then stannous chloride. The full names for some chemicals are given but not for others (see last para Page 4).

Response As you indicated, I corrected their chemical names and uniformed the use.

Specific comments Question & Comments Title: “Mercury Emission from Crematory in Japan” be better presented as “Mercury Emission from Crematories in Japan”

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Response As you indicated, I changed my title.

Question & Comments Abstract: "Considering the behavior of mercury in cremations, the findings confirmed that the mercury in stack gas originated from dental amalgam." Please make it clear.

Response I changed the pointed part as follows; "Considering the time profile of mercury and its species in cremations, the findings confirmed that the mercury in stack gas originated from dental amalgam."

Question & Comments Introduction Page 2: "According to Ministry of Health, Labor and Welfare (MHLW) in Japan (2008a), 99.9% of dead bodies were cremated in about 1600 facilities in 2007... "Please provide the total number of deaths per year, which has more implication for Hg emission from cremation.

Response I add the total number (1,108,334).

Question & Comments Introduction Page 2: Correct last sentence on para 2 as: "Emissions from crematories very likely to have a significant impact in Japan too".

Response I changed the pointed part as follows; "Emissions from crematories are also very likely to have a significant impact in Japan."

Question & Comments Introduction Page 2: In last para of Introduction authors presents the purposes of the research, others are fine but "with the goal of developing mercury removal technology" this does not match with the results and discussion presented in the manuscript. How you justify for this? -Throughout the text "actual measured data" have been used many times, it should be avoided.

Response As you indicated, I removed the goal from my paper and changed "actual measured data" to "measured data".

Question & Comments Page 3: Natural gas and oil were used as auxiliary fuel in four and three of the crematories, respectively. This expression is not clear, needs further

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clarification.

Response I changed the pointed part as follows; "Natural gas and oil were used as auxiliary fuel in four (Facilities No. 1, 2, 4, and 7) and three (Facilities No. 3, 5, and 6) of the crematories, respectively."

Question & Comments Page 4: "This speciation process is based on the...." What you want to present here?

Response I want to present a reliability of the CEM from our previous study. I changed this part as follows; Given this speciation, CEM was developed based on the Ontario Hydro method, which is used to determine the elemental, oxidised, particle-bound and total mercury emissions from coal-fired stationary sources (ASTM D6784 02, 2008); it was compared with the Ontario Hydro method periodically and showed an excellent correlation for mercury concentrations ranging from 0 to 100 $\mu\text{g}/\text{Nm}^3$ in a municipal solid waste incinerator (Chua et al., 2003).

Question & Comments Page 5: This is because the O₂ concentration is so high (15.8–20.8%)....This expression is bit confusing how O₂ concentration is 20.8? in flue gas ???

Response I understand your opinion. I calibrated the measurement machine of oxygen concentration before each sampling using a gas cylinder with 10% O₂ and ambient air. Although the machine might not be working well at the sampling, I would like to remain this part.

Question & Comments Page 5: "The mercury concentration in flue gas is influenced by the volume of exhaust gas per one cremation." Remove "one" from here.

Response As you indicated, I corrected this.

Question & Comments Page 6: "Based on actual measurements, because Hg₀ was dominant in flue gas, the Hg₀ vaporized in the main chamber was considered to have not changed to a stable state in the cooling zone as it moved to the stack through

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APCDs." I am not convinced with above statement. Authors presented that Hg0 not changed passing through cooling zone and APCDs? By now, there are sufficient literatures supporting that Hg speciation changes with change in temperature, flue gas composition, APCDs and so on. So how authors can assume that Hg0 vaporized in the main chamber was considered to have not changed to a stable state in the cooling zone as it moved to the stack through APCDs??

Response I know that there are sufficient literatures supporting that Hg speciation changes with change in temperature, flue gas composition, APCDs and so on, too. As you indicated, I cannot answer about it clearly. Therefore, I changed this part as follows; "Because Hg0 was dominant in flue gas based on measurement results, there was a difference in the chemical form between the results of thermodynamics and measurements. It might be cleared by measurement in upstream flue gas before bag filter."

Question & Comments Page 8: The following expression is out of the subject matter of this paper. "Here, we assume that the emission quantity obtained in this research is a property of each group and shifted it to the emission quantity of the next age range as 5 years passed."

Response To estimate future trends of total mercury emissions in Japan from crematories based on population demographic statistics and measured data, the above assumption is essential. The estimation of future trends is one of important parts in my paper. I am sorry that I cannot agree the reviewers' opinion.

Question & Comments Page 13: Activated carbon and catalysts are not the "Advanced APCD" as presented in Table 1. This is to be corrected. I have one general question follows: Is there some especial reason that in Facility 1 to 5 all the experiments were carried out when crematory was burning female?

Response I changed "catalyst" and "activated carbon" to "catalytic reactor" and "activated carbon filter", respectively. We have no special reason that in Facility 1 to 5 all

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the experiments were carried out when crematory was burning female. Those were coincidences!

Question & Comments Page 13: Write full form in Table 1. Is it Electrostatic precipitator?

Response Yes. I revised it.

Question & Comments Page 13: In Figure 5, "Emission quantity" to be better presented as "emission concentration".

Response I am sorry that I cannot agree the reviewers' opinion. I would like to use "Emission quantity" in this paper.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 9, 27195, 2009.

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