

Japan's comment on  
Tier III NO<sub>x</sub> Review Correspondence Group (NO<sub>x</sub>-CG) - Round 1

● **Term of Reference 1:**

Consider range of technologies (engine fitting, material, appliance, apparatus, other procedures, alternative fuels or compliance methods) that may be used to comply with the Tier III NO<sub>x</sub> standards;

➤ **Questions for consideration:**

Q1: What is the practical capability of each of these technologies for compliance with the Tier III NO<sub>x</sub> standards?

*Answer:*

Regarding SCR using urea and ammonia as reductant, it is considered highly feasible for compliance with the Tier III standards. For reference, the principle of SCR denitration equipment and its system conceptual diagram are shown in Attachment 1.

Q2: What other technologies (engine fitting, material, appliance, apparatus, other procedures, alternative fuels or compliance methods) should also be considered as part of this review?

*Answer:*

---- (blank)

Q3: What is the status of development of these technologies by marine engine manufacturers and emission control suppliers?

*Answer:*

Japan conducted laboratory test of exhaust gas denitration on engines with low-speed, middle-speed and high-speed rotation fitted with SCR, and obtained result that complies with Tier III standard.

Q4: Provide any additional information and data is pertinent for this review, including support for your answers to Q1-3, or indicate what additional data is needed and how can it be obtained.

*Answer:*

In this review, Japan plans to provide data and information which were measured in the laboratory test of exhaust gas denitration on engines with low-speed, middle-speed and high-speed rotation fitted with SCR as below.

1. Object and brief overview of laboratory test
2. Participant in the laboratory test
3. Brief overview of testing facilities
4. Position of catalyst and NO<sub>x</sub> measurement apparatus in SCR
5. Initial performance of denitration
6. Duration of the laboratory test
7. Result of operation and denitration performance in the laboratory test
8. Review on SV number

● **Term of Reference 2:**

Consider the current use of these technologies on marine diesel vessels with a view towards characterizing the introduction and demonstration of these technologies in real world applications;

➤ **Questions for consideration:**

Q5: What other marine vessels are using the Tier III NO<sub>x</sub> technology described above (or other pertinent technology)?

*Answer:*

---- (blank)

Q6: What additional information and data can you provide on the introduction and demonstration of these technologies in real world applications?

*Answer:*

Japan has conducted on-board trials of exhaust gas denitration on engines with low-speed, middle-speed and high-speed rotation fitted with SCR in commercial operation as shown in Attachment 2.

In this review, Japan plans to provide information and data of those trials as below.

1. Elements and brief overview of test vessels
2. Layout of engine room and SCR
3. Position of catalyst and NO<sub>x</sub> measurement apparatus in SCR
4. Initial performance of denitration
5. Route and duration of operation for on-board trial
6. Result of operation and denitration performance in on-board trial
7. Review on SV number

● **Term of Reference 3:**

Consider progress of engine and after-treatment manufacturers towards developing such technology and expectations for bringing Tier III NO<sub>x</sub> technologies fully to market by 2016;

➤ **Questions for consideration:**

Q7: What other additional engine and after-treatment manufactures should be considered in this review?

*Answer:*

---- (blank)

Q8: What additional information and data can you provide on the progress of engine and after-treatment manufacturers towards developing Tier III NOx technologies and expectations for bring these technologies fully to market by 2016?

*Answer:*

A study of safety measures regarding treatment of reductant including both urea and ammonia is being conducted in Japan. The result of this study of safety measures was reflected on the procedure of on-board trials mentioned above.

Regarding anti-degradation measure of SCR, Japan conducted recovery test of the catalyst. After heating catalyst with degraded denitration efficiency at 300 degrees Celsius for several hours, the denitration efficiency was found to be almost recovered to that of new one.

● **Term of Reference 4:**

Consider identification of any sub-sets of marine diesel engines where there will not be technologies available to comply with the Tier III standards;

➤ **Questions for consideration:**

Q9: What sub sets of marine diesel engines should be considered, as part of this review, where there may not be technologies available to comply with the Tier III standards by 2016?

*Answer:*

Due to the lack of space, some small vessels may need small-sized Tier III engine in order to avoid safety hazard which may occur in installing ordinary Tier III engine such as eliminating a part of its hull structure. The status of technological development of small-sized Tier III engine should be followed during this review period, and the problems occurred in installing Tier III engine into small vessels should be considered as necessary.

Q10: What additional information and data can you provide on this issue, including support to your answer to Q9?

*Answer:*  
---- (blank)

● **Term of Reference 5:**

Consider where relevant, the global availability of consumable products used by a certain technology to reduce emissions to the required standard in Tier III, including supply chain issues, e.g., restrictions on import, export and sale;

➤ **Questions for consideration:**

Q11: Presumably, this point is referring to the use of urea with SCR systems. Are there other consumable products that should be considered in this review?

*Answer:*  
Other than urea, ammonia should also be considered as reductant to be used for SCR especially in large-sized vessels. Besides, availability of catalyst as consumable products should also be considered in this review.

Q12: What additional information and data on the global availability of urea (or other relevant consumable products) can you provide, including supply chain issues, e.g., restrictions on import, export and sale?

*Answer:*  
In Japan, the amount of supply of urea for vessels is expected to be sufficiently reserved. No restriction on import, export and sale exists. Information below is planned to be provided in the later round.

1. Infrastructure regarding delivery system of urea and ammonia
2. Case study of loading of reductant on ship
3. Price and running cost of reductant

● **Term of Reference 6:**

Consider the matter including deliberation of what information and data are pertinent for the review and how that information and data should be collected and analysed."

➤ **Questions for consideration:**

Q13: What additional information would be helpful to carry out the analysis of technological developments to implement the Tier III NO<sub>x</sub> emission standards?

*Answer:*  
---- (blank)

Q14: How can this additional information be obtained in a time period and a format that will be helpful for this Correspondence Group?

*Answer:*

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