

Progress Made on NOx Emission Controls for Seagoing Vessels



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The recent International Maritime Organization's (IMO) Marine Environment Protection Committee (MEPC 66) meetings drew to a close, and with them partial agreement was found on the implementation of nitrogen oxide (NOx) emission control areas (ECAs) under the MARPOL Convention. Emissions from shipping vessels constitute a significant portion of the airborne NOx deposition around the world, and as such, establishing more stringent controls is an important step in protecting air quality and the environment in general.

Outcomes of the MEPC 66 Meetings

The beginning of April 2014 saw the conclusion of the MEPC 66 negotiations over Tier III emissions for seagoing vessels, the outcome of which was the adoption of amendments to the International Convention for the Prevention of Pollution from Ships (MARPOL Convention). MEPC 66 agreed to make the IMP Member State Audit Scheme mandatory through "verification of compliance" regulations and definitions. The Audit Scheme is expected to come into force on January 1, 2016.ⁱ

Beyond this amendment, it was also agreed that MEPC would set a date for the implementation of Tier III standards for NOx emissions which would allow the standards to be applied to any diesel engine on a marine ship constructed after January 1, 2015 operating within emission control areas.ⁱⁱ There were some disagreements as to the appropriate enforcement dates for the NOx emissions reductions. For instance Russia cited technical barriers in terms of technology availability for the NOx emissions reductions, asking for the enforcement date to be delayed until 2021.ⁱⁱⁱ On the other hand, countries such as Canada, Denmark, Japan, and the US argued for an enforcement date of 2016 given that the NOx emissions reduction technologies are well-developed and fully functional already.^{iv}

However, despite the disagreements, a compromise on the implementation dates of existing as well as future NOx emissions control areas in North America and US Caribbean NOx ECAs was reached, with 2016 being the selected enforcement date. The compromise includes a postponement of the effective date of superyachts in operation in North American and US Caribbean NOx ECAs until 2021. That said, NOx ECA areas outside of these regions have yet to be decided. The application of IMP to the Baltic Sea, for instance, has not yet been confirmed, and therefore NOx ECAs have yet to be designated. In this region alone shipping accounts for more than 13,000 tons of airborne NOx deposited to the sea every year in Russia and Sweden. Establishing NOx ECAs for the Baltic Sea would reduce NOx pollution in the region by 7,000 tons annually.^v

Dr. Joseph McCarney and Dr. Johnny Briggs of The International Association for Catalytic Control of Ship Emissions to Air, IACCSEA, explained the environmental importance of Tier III emissions controls. “In general, reducing NOx is good for the environment for various reasons. When NOx and volatile organic compounds (VOCs) react in the presence of sunlight, they form photochemical smog, a significant form of air pollution, especially in the summer. They are also involved in tropospheric production of ozone.”

Additionally, they explained that nitrogen oxides form nitric acid when dissolved in atmospheric moisture, forming a component of acid rain which contributes to the acidification of aquatic and terrestrial ecosystems. What’s more, “Excess nitrogen inputs from the atmosphere promote increased growth of phytoplankton and other marine plants which, in turn, may cause more frequent harmful algal blooms and eutrophication (the creation of oxygen-depleted “dead zones”) in some parts of the ocean.”

To put a fine point on the issue, they suggested that, “It is projected that without regulation, marine emissions of NOx in Europe will outstrip those from all terrestrial sources by 2020.”

Some regions have already demonstrated leadership in this area by implementing laws and financial levers to encourage the adoption of these technologies. According to Drs. McCarney and Briggs, Norway and to some extent Sweden are ahead of the curve. In particular, Norway will be providing funding for workshops to teach industry experts on the transfer of technology relating to the Promotion of Technical Co-operation and Transfer of Technology Relating to the Improvement of Energy Efficiency of Ships.^{vi}

“The Norwegian NOx tax and associated fund, with a 2 € per kg tax (or 0,5-1,5 € per kg to the fund) on NOx emitted within Norwegian waters, has driven the market for NOx aftertreatment technology (engines exceeding 750 kW and boilers over 10 MW). The Swedish environmental differentiated fairway dues have been an important driver for early implementation of SCR on ships. It is hoped that this week, at MEPC 66, the Committee will agree that the North American and Caribbean Nitrogen Emission Control Areas (NECAs) will come into force in 2016.”

Additional progress was made in developing the implementation of a resolution on Promotion of Technical Co-operation and Transfer of Technology Relating to the Improvement of Energy Efficiency of Ships. What's more, discussions were held regarding the guidelines to support the uniform implementation of energy efficiency regulations for ships that came into effect January 2, 2013. ^{vii}

Benefits of Tier III Emissions Controls for the Industry



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According to industry experts, there are substantial financial benefits to vessel owners and operators for adopting Tier III emissions standards. Drs. McCarney and Briggs explained the process of reducing CO₂ and NO_x emissions simultaneously from marine engines through selective catalytic reduction (SCR) technology this way:

“Although Tier II requirements do not significantly constrain combustion conditions, increased fuel efficiencies can be gained when moving to Tier III compliance. Fuel-optimisation

will increase thermal NO_x from the engine, but this is captured by the SCR. Up to 7% efficiency could potentially be achieved in certain circumstances, though a figure of 2% may be more typical. An IACCSEA cost calculation tool (which can be requested from me) allows an operator to observe the impact of increased fuel efficiency (accompanied by higher NO_x formation in the engine) on the total cost of operation.”

They went on to explain that a Tier III compliant vessel would be more competitive for charters, offering additional financial incentive to vessel owners and operators. In other words, by being it will be able to move freely into any designated NECA's from 2016 (e.g. the proposed North American NECA), a vessel would be able to accept more commissions. Those built after 2016 which have not been fitted with this technology will not be able to move freely into NECA's.

Further, the two gentlemen commented that, “A Tier III compliant vessel will have a higher re-sale value in the future than a non-Tier III complaint vessel.”

There are also substantial benefits for firms specializing in the manufacture and installation of SCR technologies in the shipping industry. What's more, this is not new technology, as Drs. McCarney and Briggs explain, “Selective catalytic reduction of NO_x using ammonia as the reducing agent was patented

in the United States by the Englehard Corporation in 1957. Since this time thousands of systems have been installed on terrestrial applications, from power plants to locomotives to automobiles.”

They also pointed out that SCR is also a proven technology in marine applications. “Systems have been installed on over 500 marine vessels over the last 30 years. Some have been in operation for well over 10 years and have accumulated >80,000 hours of experience. Engine manufacturers apply SCR to a wide range of ship types (including ferries, supply ships, RoRos, tankers, container ships, icebreakers, cargo ships, workboats, cruise ships, and foreign navy vessels for both propulsion and auxiliary engines), engine sizes, utilizing different fuels (of differing sulphur content) and operating over a range of engine conditions.”

As such, catalyst and SCR system suppliers located globally have the chance to capitalize on the implementation of Tier III emissions standards to get an edge in the marketplace.

More work obviously needs to be completed in order to come to international agreement on the implementation of stricter NOx emissions controls for seagoing vessels, but the past couple of weeks have seen progress that will definitely benefit both the industry and the environment.

Maryruth Belsey Priebe



Maryruth can't help but seek out the keys to environmental sustainability - it's the fire that gets her leaping out of bed every day. With green writing interests that range from sustainable business practices to net-zero building designs, environmental health to cleantech, and green lifestyle choices to social entrepreneurship, Maryruth has been exploring and writing about earth-matters and ethics for over a decade. You can learn more about Maryruth's work on JadeCreative.com.

Sources

ⁱ *IMO Environment Committee Considers MARPOL Amendments, Energy Efficiency.* (2014, April 7). Retrieved April 9, 2014, from Climate Change Policy & Practice: <http://climate-liisd.org/news/imo-environment-committee-considers-marpol-amendments-energy-efficiency/>

ⁱⁱ *IMO Environment Committee Considers MARPOL Amendments, Energy Efficiency.* (2014, April 7). Retrieved April 9, 2014, from Climate Change Policy & Practice: <http://climate-l.iisd.org/news/imo-environment-committee-considers-marpol-amendments-energy-efficiency/>

ⁱⁱⁱ *Summary of the 65th session of the Marine Environment Protection Committee (MEPC)* . (2014, April). Retrieved April 9, 2014, from DMA.dk: <http://www.dma.dk/SiteCollectionDocuments/Nyheder/2013/Fuld%20referat%20fra%20m%C3%B8det%20i%20im-os%20milj%C3%B8komite-uk.pdf>

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^{vii} *IMO Environment Committee Considers MARPOL Amendments, Energy Efficiency.* (2014, April 7). Retrieved April 9, 2014, from Climate Change Policy & Practice: <http://climate-l.iisd.org/news/imo-environment-committee-considers-marpol-amendments-energy-efficiency/>