IMO Tier III NOx technology status for large two stroke engines

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A status on the MAN diesel & Turbo (MDT) development of IMO Tier III NOx technology for large two stroke engines is presented. The outline for Selective Catalyst Reactor (SCR) and Exhaust Gas recirculation will briefly be presented, together with considerations regarding first and operational cost. Simple rules for scaling Tier III technology equipment based on parameters such as installed power, Tier III additive bunker period, fuel oil sulphur content and operational pattern is also presented.

The Revised MARPOL Annex VI which went in to force July 2010 has requirements on NOx emissions from new ships constructed after 1. January 2016 when operating inside a NOx Emission Control Area (NOxECA). This is the IMO Tier III NOx limit.

In many cases a NOx ECA will also be a SOx Emission Control Area. In such cases the applicable fuel sulphur limit is 0.1% after 1. January 2015. This requirement can be meet by use of low sulphur fuel or by equivalent means as an exhaust gas after-treatment scrubber. MDT are targeting Tier III engines for optimal fuel flexibility. The engines will be ready for operating on the wide range of fuel specifications known from the present engine program.

For MAN B&W low speed engine two separate technologies for Tier III are being developed: Exhaust Gas Recirculation (EGR) and Selective Catalytic Reduction (SCR).

MDT expect detailed specifications ready for Tier III engines ready by late 2013. Main capacities are expected finalised by late 2012. Presently the technologies are not ready to be issue for specifications for individual engines. However MDT are preparing guidance values for size, capacities and consumption to be applied as an initial estimate. This may then form the basis for a cost evaluation.

Demand for Tier III technology
An analysis on the present global mobility of the fleet is presented. Assuming future need for same global mobility, the Tier III technology need is outlined.

Economy
A Tier III engine will operate in Tier II mode outside NOx ECAs and in Tier III mode inside. This requires application of additional engine components and auxiliary systems. The extra cost of a Tier III engine with either EGR or SCR is expected to at the same level. However cost is subject to regional differences, sub suppliers, actual engine size and application, required fuel flexibility, new regulatory requirements and further technology optimization.

Both SCR and EGR engines will have increased fuel oil consumption when operating in Tier III mode. An SCR engine will require injection of urea solution and have special exhaust requirements for loads below 40%. If the EGR system is to be operated on fuel with sulphur content, use of NaOH solution is required in the EGR scrubber. Both systems will require power for auxiliary systems necessary for the operation. Some simple rules are presented.

Impact on engine room
All Tier III systems will have an impact on engine room, as the NOx reduction requirements present a significant change to current engine technology. Part of the development efforts are aimed at minimising space requirements, and making system components which are prepared for flexible ship board installation. For both EGR and SCR the systems will involve additional equipment on the engine itself. Additionally, the auxiliary systems and capacity for consumables require space onboard. Piping and tank capacity will rely on the actual application, and vary from ship to ship. Some outlines are presented.

Retrofit
Tier III applies only for vessels constructed after 1. January 2016. Therefore retrofit of Tier III technology is mainly relevant for vessels constructed after this date that have not been delivered with the technology. Present state of the technology is not available for retrofit on pre-2016 vessels.

Further questions

For evaluation of individual project MDT kindly ask that the timeline given above is observed, as MDT cannot supply detailed information until the maturing of the technologies has reached certain milestones. This is in order to assure the best possible information to the market and resources allocated for the technology.

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