UK Navy surface warships engines exhaust emissions study 1988-2006

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SYNOPSIS

Several studies into air pollution from surface warships made specific recommendations aimed at minimising as much as possible any potential constraints on the unrestricted, international, future operational deployment of the Royal Navy (RN) and Royal Fleet Auxiliary (RFA) flotillas. These recommendations were the basis for the development of a database which would allow the UK Ministry of Defence to centrally collect, collate, control and report periodic auditable data on energy, fuel usage and green house gases (GHG) and other gaseous emissions. This paper highlights the emissions calculation methodology and the preliminary results which provide a first comparative outlook of the RN and RFA emissions burden in terms of CO_2, SO_X, NO_X and particulate matters (PM). These results constitute a rough order of magnitude benchmark which could be used for future comparative studies and further calculation refinement. The ultimate goal being to develop a relevant and rigourous emissions compliance strategy to reflect the Secretary of State overarching environmental policy statement, and prepare for any changes in legislation including international regulatory exemptions for naval vessels.

INTRODUCTION

The UK Ministry of Defence (MoD), via the office of the Secretary of State for Defence, is committed to demonstrate that it at least meets, or exceeds, National and International Emission legislation, as far as is reasonably practicable, unless there are clear operational requirements that dictate otherwise [1]. In pursuit of that vision, a study into air pollution from ships released in 2003 [2] highlighted that there was a clear lack of understanding of both current and future contributions to the total burden of green house gases (GHG) in the atmosphere by emissions from warships. Subsequent studies produced in 2005 under the "Green Warrior" 2030 research programme [3, 4] analysed naval fuel usage records for the period 1988 to 2004 and made a number of specific recommendations aimed at minimising as much as possible any potential constraints on the unrestricted, international, future operational deployment of surface warships. These recommendations were reaffirmed in a report on compliance strategy in 2007 [5] and are the basis for the development of a database which would allow MoD to centrally collect, collate, control and report periodic auditable data on energy, fuel usage and GHG emissions on the Royal Navy (RN) and Royal Fleet Auxiliary (RFA) diesel engines and gas turbines population.

Motivation

The perceived benefits for the MoD to pursue this development program are that voluntary emission data collection could establish the environmental signature of individual platforms or classes of ships and allow MoD to develop a relevant and rigorous exhaust emission compliance strategy policy. The results of applying these metrics could also be used to inform any planned contribution to the IMO ongoing data gathering activity by the MoD. This would in turn assist MoD in making informed decisions in the planning for potential increase

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Author's Biography
Lieutenant-Commander Jacques P. OLIVIER is a Canadian Navy officer with over fifteen years of experience as a marine systems engineer, currently seconded to the Royal Navy in England (Bristol) since August 2006. His primary functions as a technical project officer are to provide expertise in diesel engines technology and exhaust emissions, and manage development programmes aimed at resolving capability gaps and legislative compliance in these areas. Jacques is a Chartered Engineer (CEng) and a Project Management Professional (PMP) who holds dual Masters Degrees in Mechanical Engineering, and, Naval Architecture & Marine Engineering from the Massachusetts Institute of Technology (MIT). He also holds an MBA from the University of Ottawa (Canada).

CONCLUSIONS

The purpose of this paper was to show the first iteration of emissions calculations and was aimed at producing a rough order of magnitude benchmark which could be used for future comparative studies. The motivation to eventually develop a relevant and rigorous exhaust emission compliance strategy policy will require more refinement and review. The following conclusions are drawn:

1. Further refinement in the calculations methodology is required, specifically with the NOx and PM figures.

2. The Kyoto Protocol targets would unlikely be met if they were applied to the UK Navy.

3. NOx and PM emissions have increased from 1988 to 1996 but have remained relatively stable since.

4. CO_2 and SOx emissions have increased from 1988 to 1996 but have showed a tendency to decrease since.

5. The UK Navy CO_2 emissions are extremely low compared to NAEI national figures (0.00011%). The SOx(SO_2) is also very low at 0.15% of the national burden.

6. Even in the event of further refinement, it may be inappropriate to compare PM and NOx values with commercial shipping due to the differing manners of operation. Comparaison against similar entities such as other Navies is thus desired.

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