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INDOOR AIR QUALITY (IAQ) ONBOARD A NAVAL SHIP: A COMPARATIVE STUDY BETWEEN COMPARTMENTS
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Abstract

Naval ships are made up of confined and enclosed spaces where air circulation is limited. For the Royal Malaysian Navy's (RMN) ageing assets that are still in service, inefficient ventilation is one of the concerns. This can lead to the elevation of indoor air pollutants (IAP) and worsen indoor air quality (IAQ) onboard, which can indirectly cause Sick Boat Syndrome (SBoS). In order to prevent SBoS, this study aims to assess the IAQ conditions of compartments inside a naval ship and to determine the parameters of compliance with the relevant standards, namely the Industry Code of Practice on Indoor Air Quality 2010 (ICOP IAQ 2010), United States Environmental Protection Agency (US EPA 2006) and Malaysian Ambient Air Quality Standards (MAAQS 2013). In addition, the differences in the IAQ parameters between the ship's compartments were determined. IAQ assessment was performed at four different compartments, namely the wardroom, cabin, machinery control room (MCR) and bridge, using calibrated handheld IAQ devices. A total of nine parameters were assessed, which were temperature, relative humidity (RH), carbon dioxide (CO₂), carbon monoxide (CO), total volatile organic compound (TVOC) particulate matter (PM_{2.5} and PM₁₀), formaldehyde (CH₂O), and nitrogen dioxide (NO₂). The differences in IAQ parameters were analysed with IBM SPSS version 26, using the Kruskal-Wallis and Dunn's Post Hoc tests. The results found that compliance with the standards can be observed for almost all of the IAQ parameters, except for PM₁₀, PM_{2.5}, TVOC, CH₂O, and NO₂, in several compartments. The Kruskal-Wallis test concluded that there were significant differences in the IAQ parameters in the compartments with p-values < 0.05. The results of Dunn's Post Hoc test indicated that all sampling points pairwise had significant differences with p-values < 0.05. The incompliance with the standards and variations of the IAQ parameters were attributed to several factors, namely crews' activities, furnishings and fuel combustion from machinery onboard the ship. In conclusion, continuous monitoring of IAQ is required to ensure good IAQ for the ship's crew to keep them healthy and improve their productivity. In the bigger picture, good IAQ is needed to ensure the readiness of the naval fleet, to preserve the sovereignty of the country. © 2023, Defence S and T Technical Bulletin. All Rights Reserved.

Author Keywords

indoor air pollutants (IAP); Indoor air quality (IAQ); naval ships; ship crew; Sick Boat Syndrome (SBoS)

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