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Sensitivity analysis of a marine gasoline engine: from power to emissions

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Numerical simulations currently represent a valid aid to assess the performance of marine engines. Anyway, most of past applications generally focused on large supercharged 4-stroke diesel engines, while few results are available in the literature for fast outboard engines, generally installed onboard of recreational crafts. Therefore, a case study on a fast outboard diesel engine (4T, 6300 rpm, 350 hp) is currently provided and discussed. The simulations are performed in the Ricardo Wave environment. Besides, NOX and CO emissions are estimated, in addition to the typical engine performances. The data, required for the model calibration, were obtained from the engine manufacturer datasheets, as well as from a set of available sea trials. Nevertheless, not all parameters were available, so as some of them have been selected based on past experience or in accordance with similarly sized diesel engines, after performing a preliminary sensitivity analysis. As concerns the assessment of NOX and CO emissions, different simulation methods are embodied to assess the chemical equilibrium in the combustion chamber and investigate the relevant incidence in terms of time effort amount, and estimated results. Current simulations reveal to be also useful to model dual fuel (gasoline/natural gas) engines and evaluate the impact of this type of alternative plant on consumptions and air emissions.

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