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Author:  [ADVANCED](#) | Volume  Page   
Keyword:



[TOP](#) > [Available Issues](#) > [Table of Contents](#) > [Abstract](#)

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[\[PDF \(705K\)\]](#) [\[References\]](#)

## Combustion Tests of Marine Fuel Oils

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The combustion characteristics (ignition delay and combustion period) of heavy fuel oil (HFO) for marine diesel engines may be affected by many factors such as density, carbon residue, asphaltene content, aromaticity, carbon/hydrogen (C/H) ratio, and so on. Investigation of the causes of operational problems in marine diesel engines should include examination of the fuel oil in service. The present study investigated the most important properties of HFO for such examination, using combustion tests and oil analysis. Marine HFOs with and without problems were analyzed using the same oil analyses and combustion tests. This study also tried to identify any threshold value of a fuel oil property related to poor ignition delay and combustion period. The constant volume combustion test apparatus (FIA 100), which has the same fuel injection mechanism as a diesel engine, was used in all the tests. This study reached the following conclusions:

- (1) Percentage of paraffinic carbon ( $\%C_p$ ) and C/H mass ratio of marine HFO have a good correlation with the combustion characteristics.
- (2) Density has a higher correlation with the combustion characteristics than viscosity.
- (3) Carbon residue and asphaltene in fuel oil have lower correlations with ignition delay, but some correlation with combustion period.
- (4) Sulfur content has a low correlation with the combustion characteristics.
- (5) Threshold values of C/H mass ratio = 8.3 may indicate ignition delay and prolonged combustion period in fuel oils of poor quality.

**Keywords:** [Combustion test](#), [Carbon hydrogen ratio](#), [Marine fuel oil](#), [Carbon distribution](#), [Paraffinic carbon](#), [Marine diesel engine](#)

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