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Investigating the effect of in-cylinder gas compositions on sulfuric acid formation and condensation using CFD modeling under large two-stroke marine engine-like conditions MICHAEL VINCENT JENSEN, ARASH NEMATI, JENS HONORE WALTHER, Technical University of Denmark — A computational fluid dynamic simulation is utilized to model the formation and condensation of sulfuric acid (H_2SO_4) under large two-stroke marine diesel engine like conditions. A skeletal chemical mechanism coupled with a sulfur subset is used to simulate the combustion process and the formation of sulfur oxides (SO_x) and H_2SO_4. A fluid film model coupled with the Eulerian in-cylinder gas phase describes the condensation of H_2SO_4. Exhaust gas recirculation (EGR) is a well-known method to decrease the nitrogen oxides (NO_x) emission. However, one of the side-effects of EGR may be an increase in sulfuric acid condensation which leads to cold corrosion of liner. In this study the initial in-cylinder gas compositions are varied to imitate different EGR compositions (wet and dry) and the associated effects on the formation and condensation of H_2SO_4 are investigated. It is found that the amount of SO_x formation is similar for these two kinds of EGR which is lower than base case (without EGR). The interesting finding is that the H_2SO_4 vapor formation for wet and dry EGR is higher and lower than the base case, respectively. The current CFD results show that applying EGR does not increase the H_2SO_4 condensation.

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