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# Investigation of the NO2 Formation in the Exhaust Duct of a Dual Fuel Test Engine

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**Abstract :** The formation of nitrogen dioxide NO2 in the exhaust duct of a MAN dual fuel test engine has been investigated numerically. The dual fuel engine concept with premixed lean methane combustion ignited through diesel pilot flames reveals high potential for the abatement of the NOx formation. The drawback of this combustion method, however, is the high NO2 formation due to the increasing concentration of unburned hydrocarbons. This promotes the conversion of NO to NO2, which is toxic and characterized through its yellow color. The results presented in this paper cover a wide range of engine operation points from full load to part load for different air to fuel ratios. The effects of temperature, pressure and concentrations of unburned methane and nitric oxide on NO2 formation in the exhaust duct has been investigated on the basis of a zero-dimensional well stirred reactor model implemented in Cantera, which calculates the steady state of a uniform composition for a certain residence time. It can be shown that the simulated conversion of NO to NO2 match the experimental results fairly well. The partial oxidation of methane followed by CO production can be predicted as well. It can also be concluded that the lower temperature limit for which no conversion takes place, depends mainly on the concentration of the unburned hydrocarbons in the exhaust.

**Keywords :** cantera, dual fuel engines, exhaust tract, numerical modeling of NO2 formation, well stirred reactor
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