SENSITIVITY ANALYSIS OF A QUASI-DIMENSIONAL MODEL FOR SI ENGINES FUELLED WITH GASOLINE-ALCOHOL BLENDS

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ABSTRACT – Methanol and ethanol are interesting spark-ignition engine fuels, both from a production and an end-use point of view. Despite promising experimental results, the full potential of these fuels remain to be explored. In this respect, quasi-dimensional engine simulation codes are especially useful as they allow cheap and fast optimization of engines. Since methanol and ethanol have different properties compared to gasoline, it is important to know how to modify simulation models currently calibrated for gasoline operation to operate on gasoline-alcohol blends or pure alcohols. The aim of the current work was to do a sensitivity analysis of a quasi-dimensional model for spark ignition engines running on gasoline-alcohol blends. Therefore a new correlation for the laminar burning velocity of gasoline-alcohol blends is implemented in the quasi-dimensional model. Several factors (such as the laminar burning velocity, initial flame kernel, residual gas fraction, turbulence…) have been investigated and the sensitivity of these factors and the used submodels on the predictive performance was assessed for different gasoline-methanol blends. The results show the importance of the laminar burning velocity correlation, the initial flame kernel and the estimation of the residual gas fraction.