A COMPREHENSIVE INVESTIGATION ON THE EMISSIONS OF ETHANOL HCCI ENGINES

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ABSTRACT

The environmental impact of automotive transport systems and the need for reducing petroleum dependence lead to the development of alternative combustion strategies and the use of renewable fuels. In this work, HCCI combustion mode, by using ethanol as fuel, is analysed in order to clarify the role of specific technical solutions, such as power boosting, downsizing, swirl motion, and of the thermo-physical properties of ethanol on emissions and performance of the engine. A multidimensional numerical approach, coupled with a kinetic reaction mechanism for ethanol oxidation and NO\textsubscript{x} formation, is proposed and validated against experimental measurements. Specifically, CO emissions assessment is a major issue of this work, as this pollutant is strictly related to inhomogeneities in the combustion chamber near the walls and a multidimensional approach with an adequate grid resolution is mandatory for a correct simulation. CO, CO\textsubscript{2}, UHC and NO\textsubscript{x} emissions, specific fuel consumption, heat release rate and in-cylinder pressure are evaluated in order to give recommendations on the most suitable technological solutions.

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REFERENCES