

COMBUSTION AND PERFORMANCE ANALYSIS OF A SPARK IGNITION ENGINE FUELED WITH AMMONIA/HYDROGEN BLENDS

L. Teodosio*, F. Berni, G. Langella*****

e-mail of the principal author

* luigi.teodosio@unina.it

**fabio.berni@unimore.it

***giuseppe.langella@unina.it

Abstract

In this work, a numerical study on combustion characteristics, performance and NO_x emissions of a single-cylinder spark ignition engine fueled with premixed ammonia/hydrogen blends is carried out. A 0D/1D model of the engine is developed and integrated with phenomenological in-cylinder sub-models. A chemical kinetics model, provided with the outcomes of the 1D engine model is utilized to reproduce the NO_x emissions. The numerical procedure demonstrates to adequately replicate the measured in-cylinder pressure traces, also correctly reproducing the main experimental performance for a set of eight operating points; model validation is also verified for NO_x emissions by exploring both stoichiometric and lean air/fuel mixtures and by varying the hydrogen (H₂) content over total fuel, up to a maximum hydrogen volume percentage of 40%. The proposed numerical methodology is a promising tool to support the identification of optimal performance of SI engines fueled with ammonia/hydrogen mixtures.