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Evaluation of CFD predictions of mixing properties of hydrogen as a fuel in a model premixer by experimental and statistical tools AMIN AKBARI, VINCE MCDONELL, SCOTT SAMUELSEN, UCI, ADVANCED POWER AND ENERGY PROGRAM (APEP) TEAM — Mixing properties of hydrogen, as a new fuel of interest in combustion community research, have been numerically studied utilizing various CFD approaches in both axial and radial fuel injection type premixer configurations to be applied in lean combustion techniques research for design purposes. Numerical predictions of RANS and LES turbulent models have been evaluated by conducting experimental measurements. Comprehensive qualitative and quantitative comparisons have been made between numerical and experimental results to investigate capabilities of different CFD approaches to provide reliable predictions of flow field properties. Moreover, extensive statistical study has been accomplished, and ANOVA results are interpreted beside other comparison approaches to draw fruitful conclusions. In general, sensitivity of numerical predictions to different turbulent models as well as sensitivity to different turbulent Schmidt numbers has been explored. The result of comparison suggests more sensitivity to turbulent models for radial injection configurations. However, more sensitivity to Sc_t has been witnessed for the axial configuration. In general, RSM turbulent model with Sc_t=0.7 provides the most promising predictions for various combinations of different fuels and injection types.

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