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Design Algorithm Evaluation of Swirler-Injector Systems in Liquid-Burning Combustion Chambers

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Abstract **-** Liquid-burning combustion chambers have a wide range of applications in propulsion systems and energy conversion processes. The growing need for reliable and low-NOx combustion systems highlights the role of high-performance burners, where the main design criticalities are related to injectors and swirlers. In the current study, an algorithm for coupling the design procedure of pressure-swirl injectors and axial swirlers is introduced. Also, this algorithm emphasizes the interrelation between the design parameters of these two components via employing the length of the recirculation zone as the coupling parameter for building a relationship between the design characteristics of the injector and swirler. We have employed Maximum Entropy Formalism (MEF) to obtain a prediction for the distribution of diameters and velocities of fuel droplets, which takes part as a criterion in the design procedure of the injector.

Keywords**:** Swirler-injector systems; combustion chambers; energy conversion; pressure-swirl injector; axial swirler.