

Abstract Submitted
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The Effect of Inlet Swirler Design on Passive Control of Combustion Noise and Instability¹ ALEX BORSUK, State University of New York at Buffalo, AJAY AGRAWAL, JUSTIN WILLIAMS, University of Alabama — The use of porous inert media (PIM) in the reaction zone of a swirl-stabilized lean-premixed combustor provides a passive method of controlling combustion noise and instability. Swirl-stabilized combustors use an inlet swirler that imparts a swirling motion to the reactant flow and stabilizes the flame. In this study, the effect of swirler design and swirl number on combustion without and with PIM has been investigated experimentally, using a methane-fueled quartz combustor at atmospheric pressure. Swirler vane angle was varied to obtain swirl numbers of 0.45, 0.78, and 1.10. Swirler location was varied to obtain recess depth in the premixer tube of 0, 2.5, and 5 cm. Experiments were conducted at a constant air flow rate of 300 SLPM and equivalence ratios of 0.7, 0.75, and 0.8. PIM geometries with increasing and decreasing flow cross-sectional area were tested. The performance of each test case is compared by measuring sound pressure levels (SPL) with a microphone probe and observing the flame behavior. Results indicate that PIM can be effective in reducing noise and instability over a wide range of operating conditions. Total SPL reductions of up to 7.6 dBA were observed with PIM.

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Amy Lang
University of Alabama

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