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Characterization of Noise and Instability in a Commercial Burner[1] STEWART CARPENTER, Case Western Reserve University, AJAY AGRAWAL, The University of Alabama — A range of combustion applications produce noise as a significant and undesirable output. Concurrently, efforts to reduce emissions through lean premixed combustion have shown this process to be prone to developing instabilities. In this study a commercial-style combustor was investigated to characterize combustion noise and instabilities. Knowledge in this area is intended for future research involving the application of porous inert media (PIM) in industrial burners. Porous media has been used to passively suppress both combustion noise and instabilities in a laboratory setting, but has yet to be implemented in a commercial burner. Combustion experiments were conducted in an industrial-scale lean premixed burner using natural gas while varying equivalence ratio and reactant flow rate. Acoustic data was acquired using a microphone probe placed in the plane of the combustor exit. Measurements were analyzed in the frequency spectrum to quantify noise spectra and detect the development of instabilities. Results have indicated the occurrence of strong combustion instability at certain conditions. Additionally, research has supported the general relationship of increased noise production with increasing equivalence ratio and heat release rate. Adverse effects of combustion instability were accompanied with flashback and downstream acoustic excitation.

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