*** ABSTRACT ONLY ***

FIRE SUPPRESSION EFFICIENCY SCREENING METHOD

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Most of the current methods for fire suppression efficiency screening (e.g., cup burners) are designed for screening agents that can be delivered in the form of vapor. The search for alternatives to halons for fire suppression applications has identified several classes of condensed-phase compounds that may be delivered in the form of droplets or aerosols.

The objective of this work is to design and build a bench-scale apparatus suitable for evaluating fire suppression efficiencies of these new advanced liquid agents. Five important design attributes have been considered during the inception of the apparatus: (1) applicability, (2) amenable to analysis, (3) repeatability, (4) flexibility, and (5) operability. There are three major parts to the apparatus: (1) burner, (2) flow facility, and (3) droplet/aerosol generator. A porous cylindrical burner (using propane) operated in a counterflow diffusion configuration is used. This burner has several inherited advantages. The flow field of the flame in the forward stagnation region is simple and amenable to analysis. The burner can be operated easily over a wide range of fuel and oxidizer velocities, depending on whether an envelope or wake flame configuration is required. The flame extinction (blow-off) limit can be observed with little ambiguity and good reproducibility. The flame structure can be easily probed non-intrusively, if desired. The flow facility is a small-scale vertical wind tunnel which consists of a blower, a flow straightener, a contraction section, and a test section where the burner is placed cross-flow. The main function of the flow facility is to supply a uniform flow of oxidizer with a low turbulence intensity to the burner and to facilitate the delivery of liquid agent droplets or aerosols to the flame. Liquid droplets (25 to 250 μm) will be generated by using a multiple orifice piezoelectric droplet generator, and an aerosol (< 25 μm) generator will be designed, based on candidate techniques identified in the aerosol literature. The characterization of the experimental facility using an inert gas (nitrogen) has been performed. Nitrogen concentrations at blow-off under low strain rates were found to be comparable to the values obtained from the cup burner tests. Detailed apparatus design analysis and some pertinent technical issues will be presented and discussed.

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