Performance Evaluation of Wildland Fire Chemicals using a custom-built Thermal Canister

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Objective

- Develop a concept test assembly to evaluate the performance of wildland fire chemicals.
- Fabricate test assembly.
- Validate the concept with experimental data.
Experimental Method

(a) Thermal Canister Configuration [1]

(b) Exploded view of the Thermal Canister [1]
Test Methodology

- Fuel type: feather moss
- Treatments: water, gel and foam at coverage level 4
- Quantity measured: Heat release rate
- Heat source: radiant panel
- Measurement instruments: Thermocouples and anemometer connected to multiple DAQ systems
Energy Flow

Incident and Emitted Radiation Model [1]

Control volume of the energy through the exhaust pipe [1]
Heat Release Rate

\[ q_{\text{total}} = \rho V A_c \sqrt{\frac{2(P_t - P_s)}{\rho}} \Delta T_e - \sum_{i=0}^{10} \left\{ \frac{A_s}{\varepsilon} \left( \frac{k \Delta T_W}{W} + \sigma \varepsilon \left[ T_2 (W, t)^4 + T_1 (0, t)^4 - 2T_\infty^4 \right] \right) \right\}_i \]

- Heat from flue gases
- Heat absorbed by walls of canister
Experimental Setup

Canister Setup

Exhaust Setup