FACULTY OF ENGINEERING
UNIVERSITY OF ALBERTA

Mechanical Engineering

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

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*moving life forward*

# Objective

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

# Experimental Method

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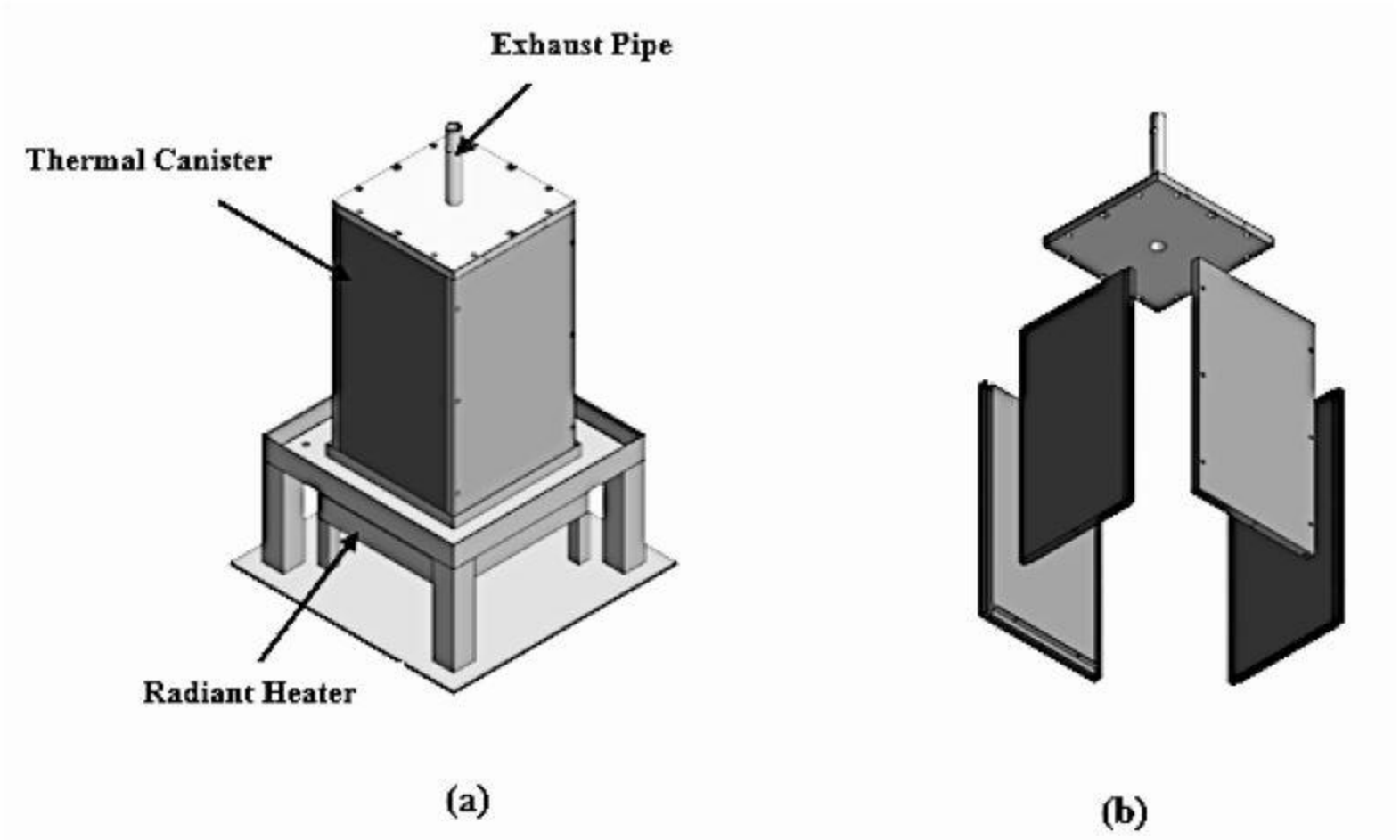


Thermal Canister Configuration [1]

Exploded view of the Thermal Canister [1]

# Test Methodology

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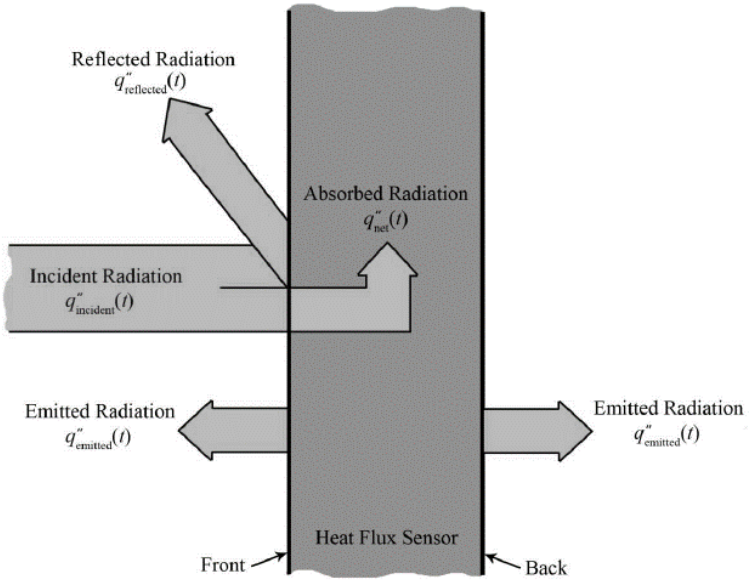
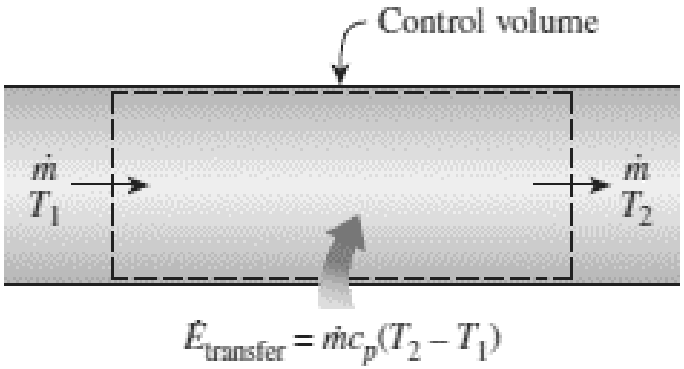
- Fuel type: feather moss
- Treatments: water, gel and foam at coverage level 4
- Quantity measured: Heat release rate
- Heat source: radiant panel
- Measurement instruments: Thermocouples and anemometer connected to multiple DAQ systems

# Energy Flow




Incident and Emitted Radiation Model [1]




Control volume of the energy through the exhaust pipe [1]

# Heat Release Rate

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$$q'_{\text{total}} = \rho V A_c \sqrt{\frac{2(P_t - P_s)}{\rho}} \Delta T_e - \sum_{i=10}^{10} \left\{ \frac{A_s}{\varepsilon} \left( \frac{k \Delta T_W}{W} + \sigma \varepsilon [T_2(W,t)^4 + T_1(0,t)^4 - 2T_\infty^4] \right) \right\}_i$$

Heat from flue gases

Heat absorbed by walls of canister

# Experimental Setup

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Canister Setup

Exhaust Setup

# References

[1] S. Anderson, “Quantification of Performance of Wildfire Chemicals using Custom-Built Heat Flux Sensors”, University of Alberta, MSc. Thesis, 2015.