

# Flame Research Tunnel Furnace

**T**he CANMET Energy Technology Centre's flame research tunnel furnace, was conceived as a versatile facility for the study of combustion aerodynamics, burner performance, and the characterization of pollutants in relation to flame properties and of heat transfer from flames. The furnace, designed for a thermal input of 0.7 MW (2.5 GJ/h), is 4.25 metres long and one metre in diameter.



*Flame Profiling*

Twenty-eight separate cooling segments, flanged together, on the horizontal axis along the furnace length enable heat transfer efficiencies of various fuels to be studied. These segments are shaped like bourdon tubes in order to accommodate a continuous access slot along the furnace length, which permits visual observations of the flame as well as the introduction of measuring probes for in-flame measurements at any location.

In most trials, the facility is operated at a nominal value of about 1.5 GJ/h and controlled at a 3% or 5% excess oxygen level in the flue gas. Typically, the following operational and combustion performance parameters are measured:

- fuel input rate, moisture and particle size;
- atomizing air/steam input rate, temperature and pressure;
- combustion air input rate and temperature;
- axial distribution of heat absorbed by the furnace cooling circuits;
- incidental radiation by 2Π ellipsoidal radiometer;
- total heat flux by heat flux probe;
- radial flame temperature profiles by suction pyrometer;
- flame emissivity using narrow angle radiometer;

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- radial gas composition profiles;
- furnace exit gas temperature and composition; and
- particulate loading in furnace exit gas.

A refractory-lined, adiabatic combustion chamber can be installed between the burner and the tunnel furnace, if needed, to simulate rotary kiln environments. 315° of the circumference of each calorimetric section can be lined with refractory brick, leaving the remaining 45° of each section unlined to impose a thermal load on the flames, representative of a product charge. The furnace is typically equipped with a variable, swirl research burner or commercial burners.

CETC'S R&D facilities are available for use on a "fee-for-service" basis.

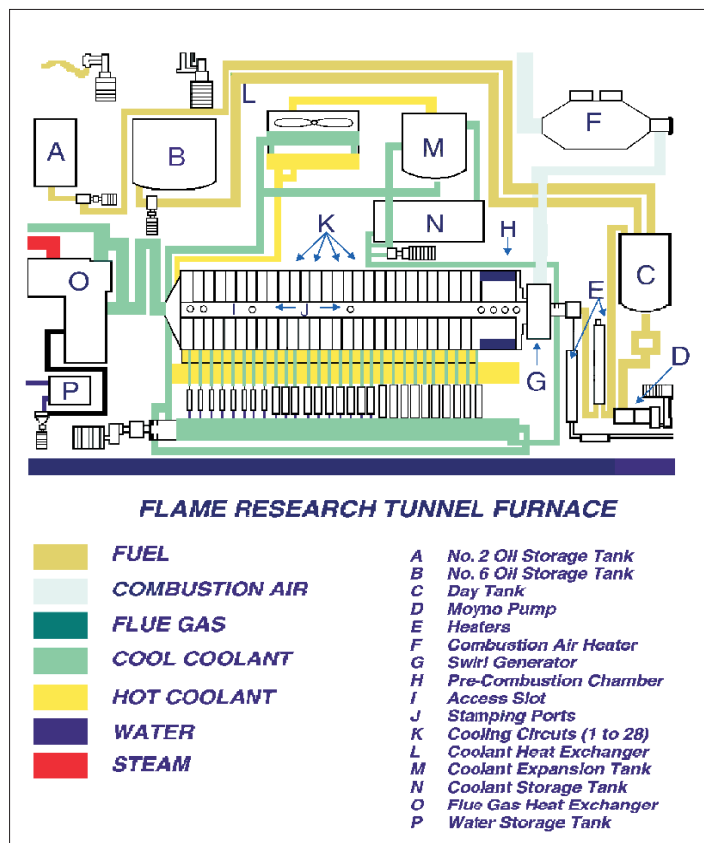


Fig. A1: Schematic of the Flame Research Tunnel Furnace

***For further information, please contact:***

***CANMET Energy Technology Centre  
Natural Resources Canada  
1 Haanel Drive  
Nepean, Ontario  
Canada K1A 1M1***

***Joe Wong  
CO<sub>2</sub> Abatement  
Tel: (613) 996-6207  
Fax: (613) 992-9335  
E-Mail: jowong@nrcan.gc.ca***

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