Pulverized Coal Combustion

With Canadian industries and utilities converting from premium fuels to indigenous and often low-quality coals, the CANMET Energy Technology Centre (CETC) recognizes the increasing importance of coal in our domestic energy requirements, and accordingly supports research that promotes the economically and environmentally responsible use of coal.

Flame Probing in Tunnel Furnace

Optimized Profitability through CETC Research Services

We can provide research services aimed at optimizing the profitability of companies whose industrial processes rely on the high combustion performance of coal. We are collaborating with industry, for example, in determining the significant combustion performance characteristics of new coal deposits for electrical power generation and industrial use. Perhaps you may wish to join us in this or one of several other current research activities:

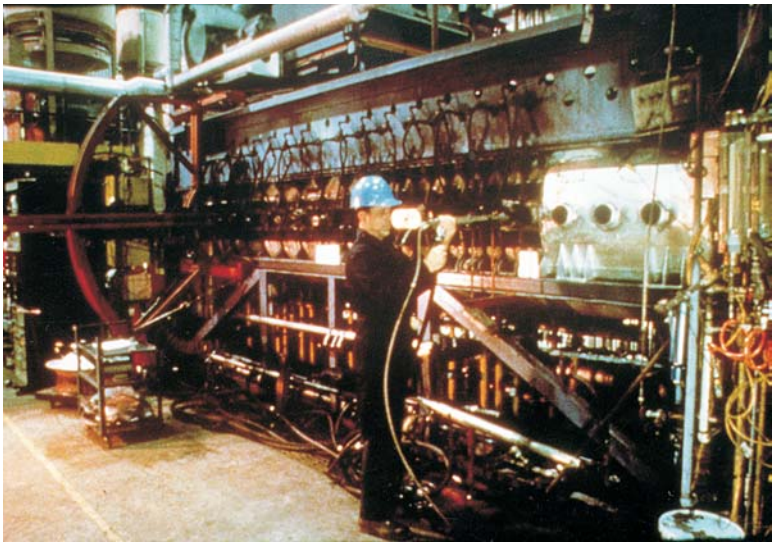
- determining combustion performance, heat transfer and emission characteristics of Canadian coals and rejects for conventional power generation and industrial use;
- producing an updated reference databank of combustion performance and emission characteristics of commercial Canadian coals;
- facilitating substitution of oil with coal in industrial combustion systems;
- assessing effects of coal cleaning on heat transfer, deposition and emission characteristics of Canadian thermal coals;
- studying the fundamentals of ignition, devolatilization, and combustion burnout of unreactive Canadian coals and reject materials;
- determining combustion and handling characteristics of raw and clean coal;
- evaluating the slagging and fouling potential both of coal from Canadian deposits for use in power utility boilers and of ash constituents on radiant heat transfer surfaces and superheater tubes;

Advanced Combustion Technologies

- developing a mathematical model of coal combustion in the research tunnel furnace to predict flame properties;
- developing and applying non-intrusive diagnostic techniques to flames, and then comparing these methods by calibration to conventional methods of flame measurement and heat transfer characterization; and
- designing and commissioning a small-scale reactivity furnace for studying pulverized coal flame reactions.

Scientists from PTL Research Ltd., International Energy Agency, Thermal Sciences Ltd., AOSTRA, Stone & Webster Canada Ltd., and some other companies are already collaborating with us.

Fully funded and cost-shared contracts, as well as special bilateral agreements, can be drawn up to assist industry.



Pilot-Scale Tunnel Furnace

R&D Facilities

Coal Reactivity

A 63 mm diameter x 2 m long entrained flow combustion reactor provides time/temperature histories of coal devolatilization and char burnout. Data generated are used in mathematical models for validation. The data are also used to develop new models for evaluating combustion and gasification processes.

Our laboratory is equipped with such specialized apparatus as samplers and analyzers, probes, radiometers and various other one-of-a-kind apparatus such as:

- IFRF probes for flame diagnostic and heat transfer;
- point-plane in-site resistivity apparatus;
- laser-based technique to measure gas temperature and species concentration (CARS); and
- high-speed flow visualization equipment.

For investigating the combustion and slagging characteristics of pulverized coal, we have a pulverized coal-fired research boiler (PSRB). It consists of two opposed low-swirl burners and has a full-load firing rate of 2.5 GJ/h. The twin burners can be located in three basic positions to vary combustion chamber residence times from 1 to 3 seconds. With the PSRB, we are also investigating the use of heavy oil, high-sulphur pitch, or residues from heavy oil and oil sands upgrading as fuel substitutes, with reduced emissions of nitrogen and sulphur oxides.

The flame properties and heat transfer characteristics of these fuels are studied in CETC's flame tunnel furnace.

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

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