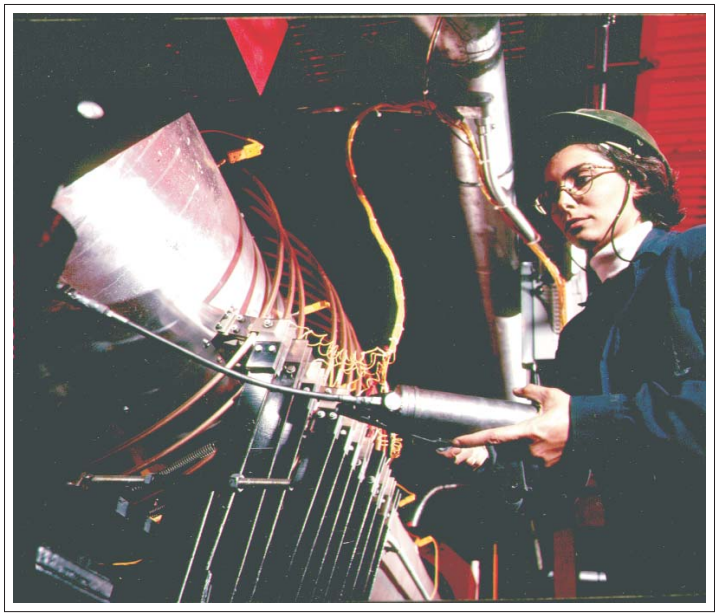
Rotary Kiln

Kiln Used for Industrial Process Improvement

The CANMET Energy Technology Centre (CETC) houses a unique and versatile pilot-scale 1 MW_t rotary kiln. Our scientists and engineers work closely with clients to overcome a variety of energy efficiency and emissions challenges: waste combustion and incineration, metals recovery from industrial waste tailings, control of mercury and hazardous air pollutant emissions, soil remediation, catalyst recovery, electric air furnace dust vetrification and zinc recovery, catalyst recovery, bio-fuel combustion, turbine blade corrosion...



Kiln Operation

In a project with Environment Canada, the rotary kiln was used to demonstrate that a combustion process could facilitate the cleanup of oil spills. Oil-soaked debris containing sorbents, contaminated soil and gravel was burned in CETC's kiln. Results confirmed the effectiveness of combustion processes in site remediation with minimal complication.

In another study with Suncor Inc. and Syncrude Canada Ltd., titanium and zirconium metals were recovered from the combustion of bitumen in flotation concentrates of tar sand tailings. CETC showed that the properties of pyrite, siderite and other minerals could be altered during combustion to increase the yield of metal reclamation.

CETC helps clients optimize processes, reduce operating costs, evaluate waste disposal and reclamation options and assess environmental performance. Clients use the results from studies to:

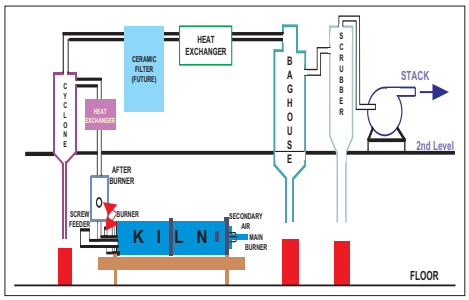
- compare costs and the performances of low-grade fuels;
- evaluate the performance of natural gas and fuel oil burners and other equipment;
- improve energy efficiency of thermal processes, e.g. for solid fuels and slurries;
- optimize combustion efficiency of refuse-derived fuels; and
- reduce acid gas and particulate emissions.

The pilot-scale rotary kiln is well suited for studies involving:

- waste combustion and incineration;
- minerals roasting, sintering and calcining; and
- thermal drying of solid fuels, slurries and concentrate.

Partner With CETC

CETC welcomes requests from industry and other government departments to conduct research and investigative studies. Collaboration can be conducted on a cost-shared or cost-recovery basis. Client confidentiality is assured.



Schematic of the Rotary Kiln

Kiln Features

The kiln incorporates key design features and environmental safeguards: an afterburner, a cyclone, a baghouse and a wet scrubber. These components are standard features in continuously- operating commercial plants. Experimental results from the pilot-scale kiln can be used to scale-up processes. As such, this type of research is well suited for better business decisions. For example, processes can be optimized for lime calcination in the pulp and paper industry. Alternatively, the environmental acceptability of incinerating residential, industrial and commercial wastes can be ascertained.

Specifications

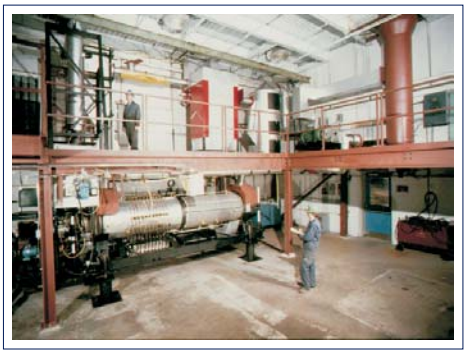
CETC's rotary kiln is 4.27 m long, with a 0.41m inside diameter and a 0.66 m outside diameter. The inside lining is made of a high temperature, erosion-resistant, castable refractory that can withstand 1200ºC. It is fitted with refractory-material lifting bars to expedite continuous movement of the feed through the kiln and to achieve good contact between gases and solids. Rotation is adjustable from 3 to 6 RPM. Solid matter or sludge can be fed/processed at rates of 20 to 200 kg/h. The residence time of the feeds can be varied by changing the rotating speed and the slope of the kiln, or both.

Fuel and Burners

The kiln has two burners, one at each end of the reactor, and can be manually or automatically fired with natural gas or fuel-oil, or a combination of both. Their input is 1 MW_t. The draft in the kiln is controlled by a variable speed ID-fan. The exhaust gas flows counter-current to the feed. The kiln's gaseous environment can be made either oxidizing or reducing.

Emission Control

The emission control units for CETC's kiln include an afterburner, a multiclone, a baghouse and a two-stage wet scrubber. The



1 MW_t Thermal Rotary Kiln

afterburner unit, with its own two burners and a separate air and fuel control system, is used to achieve complete combustion of volatiles and organics in the flue gas. The flue gas passes from the afterburner to the multiclone and the baghouse where particulates are captured. Sulphur dioxide (SO_2) is captured by the two-stage wet scrubber with the addition of limestone. Entrained particulates in the flue gas stream can be withdrawn to determine loading, particle sizing, chemical speciation, sulphur retention, etc.

Computer Control

A dedicated computer continuously monitors temperature, pressure and flue-gas composition by using LabVIEW software and a high performance, multichannel signal- conditioning measurement platform (Signal Conditioning Extensions for Instrumentation or SCXI) and data acquisition system.

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