## Wood stoves Back to basics



NRC, Lakewood, Ryerson, and a dedicated professor collaborate to make wood-burning stoves more efficient.

Canadians purchased more than 200 000 — twice as many per capita as the one million sold in the United States in 1979. And the demand continues. North America has gone back to the hearth the wood stove is "in."

Used for thousands of years throughout the world, wood provided 70 per cent of Canada's energy requirements during the last century. Since wood is low in cost, readily available, and renewable, people are again turning to it as an alternative fuel to combat increased fuel prices and conserve energy.

Wood, unlike oil and gas, does not burn uniformly. It is considered a multifuel as heat is produced during the combustion of both gas and solid. Because of these complexities, very little research has been carried out on combustion and heat transfer. As a result, the equipment used for burning wood has always been relatively low technology, and wood stoves have been designed by trial and error with little attention being given to the intricacies of the whole process. Currently, even the best wood stove operates at only a maximum 66 per cent efficiency, meaning that 34 per cent of the energy is lost. Poor ones, on the other hand, produce toxic fumes and carbon monoxide; air currents can cause small

explosions in the combustion chamber; and the buildup of creosote deposits in the chimney increases the risk of fire.

Some 320 km northeast of Toronto lies the small village (population 1600) of Bobcaygeon, and it is here that a company incorporated only five years ago (present staff 50) has tackled some of these inherent problems. Lakewood Manufacturing Limited produced its first wood stove in February 1977, and 10 months later, its one-thousandth. By mid-1979, 5000 stoves had been completed. Today, Lakewood has become one of this country's larger manufacturers of wood-burning stoves. Through its licensee organization, the Lakewood line of stoves is now produced by 14 licensees in the United States and Canada.

"All our stoves were designed using known technology and combustion and heat transfer strategies," says Clyde L. Logue, Vice-President. "They were certainly not the ultimate in efficiency, but they worked. However, in searching the literature, there was little technical information availble and no work had been done on combustion efficiency or on heat transfer. What tests had been done were limited and definitely nonrepeatable from a scientific point of view. We were essentially flying blind, using only our intuition and expertise to guide us. So, we decided the time had come to obtain hard technical information to allow us to test our stoves so we could

Professor Erwin Fernbach with some of the measuring instruments designed and developed in his laboratory to study the wood-burning process.

Le professeur Erwin Fernbach, et quelques-uns des instruments de mesure conçus et mis au point dans son laboratoire pour étudier le processus de la combustion du bois.

design both stoves and furnaces for maximum efficiency."

Contact was established with the Ryerson Polytechnical Institute's Department of Mathematics, Physics, and Computer Science, and with Professor Erwin Fernbach (who is so enthralled with wood as an energy saver that he gave up studying nuclear reactors), and Lakewood approached the National Research Council for assistance under its IRAP-M program, which is specially geared to assist smaller firms with little or no established research facilities of their own.

"When I was asked to take charge of the project," says Professor Fernbach, "it all seemed so very much like attempting to re-invent the wheel. After all, wood energy had been extensively used and there seemed to be little new ground to break. It came as a surprise to find a great number of problems are still waiting to be solved — from the very mechanisms governing the combustion and pyrolysis of wood to the development of devices to transform the chemical energy of wood into other energy forms."