

At Sudbury, Ont., the International Nickel Co. of Canada, Ltd. (INCO) continued development of the Clarabelle open-pit extension and the Levack East mine, where production is expected to begin in 1984. In Manitoba, development work continued at the three operating mines, Birchtree, Pipe and Thompson. INCO started construction of a new rolling mill in the Sudbury district for direct rolling of metal powders to make coinage strip. The plant was scheduled to be in operation in 1978.

Six companies mined nickel ores in Canada during 1976. Falconbridge Nickel Mines Ltd., the second largest producer, continued development work at the Lockerby mine, scheduled to be producing at capacity in 1978. The Thierry deposit, near Pickle Crow, Ont., of Union Minière Explorations and Mining Co. Ltd. started production in August 1976. Three nickel producers ceased mining operations during the year.

## Copper

### 12.3.3

Canadian mine production of recoverable copper amounted to 747 135 tonnes valued at \$1,126.2 million in 1976 (Table 12.9). Canada produced 9.4% of the world's newly mined copper and ranked as the fourth largest producer. World mine production of copper increased 9% from 1975. Canadian exports of copper concentrates decreased 9% while exports of refined copper increased 12%. Domestic consumption of copper fell by 25% to the lowest level since 1964.

Copper and nickel-copper ores were smelted at five locations in Canada at the end of 1976. INCO continued to operate an oxygen flash smelter at Copper Cliff, Ont. Falconbridge operated a smelter at Falconbridge, Ont., treating nickel-copper concentrates. Ores and concentrates from most mines in the Atlantic provinces, Quebec and Ontario were processed at the Noranda smelter of Noranda Mines Ltd. or at the Murdochville smelter of Gaspé Copper Mines Ltd., both in Quebec, where major expansion programs have been completed. At Murdochville, smelter production was 67 000 tonnes of anode copper in 1976. A 270 000 tonnes a year sulphuric acid plant has been built and some acid was used to leach copper from low-grade oxide ores from the Copper Mountain mine. The expanded facilities encountered serious and lengthy start-up problems in 1974 and 1975. At Noranda, operation of a new continuous smelting process reactor, capable of producing 50 000 tonnes a year of blister copper in one furnace directly from concentrates, improved during the year. A run of 180 days was achieved without shutdown for refractory repairs. Operation of the reactor began early in 1973. A shortage of concentrates was experienced at Noranda in 1976 and production fell to 208 000 tonnes of anode copper compared with peak production of 244 000 tonnes in 1974. Hudson Bay Mining and Smelting Co. Ltd. operates a smelter at Flin Flon, Man. and produces anode copper which is refined at the Montreal refinery of Canadian Copper Refiners Ltd.

Falconbridge reactivated its smelter modernization program. Expenditures in 1976 were \$32 million of an estimated total cost of \$97 million. Start-up of the new facilities was scheduled for 1978.

Afton Mines Ltd. continued to build a new copper smelter at Kamloops, BC. Start-up of the project was scheduled for 1977. The smelter is to produce 22 000 tonnes of blister annually to be exported under long-term contract to the United Kingdom.

A new Canadian hydrometallurgical process to produce copper from concentrates underwent pilot plant testing in 1976. The process was developed by Sherritt Gordon Mines Ltd. and Cominco Ltd. with financial assistance from the federal government. The test demonstrated the commercial viability of the process, said to be environmentally clean and applicable to a wide range of copper sulphide concentrates. The process produces high purity copper and sulphur in elemental form.

Electrolytic copper refineries were operated by INCO at Copper Cliff, Ont., and by Canadian Copper Refiners at Montreal East, Que. INCO's copper refining capacity at Copper Cliff was 192 000 tonnes a year. Copper is recovered in part as a byproduct from the refining of nickel. Canadian Copper Refiners has a capacity of 435 000 tonnes of refined copper a year, making it the world's largest copper refinery.

As a result of depressed copper consumption in Japan and higher treatment charges sought by Japanese smelters, the shift of Canadian concentrate sales away from Japan continued in 1976. The displaced concentrates were processed at smelters in North