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# THE CANADIAN MINERAL INDUSTRY

## MONTHLY REPORT

MAY 1988

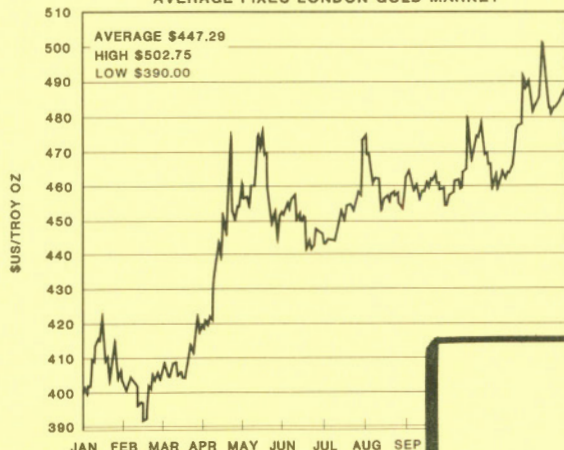
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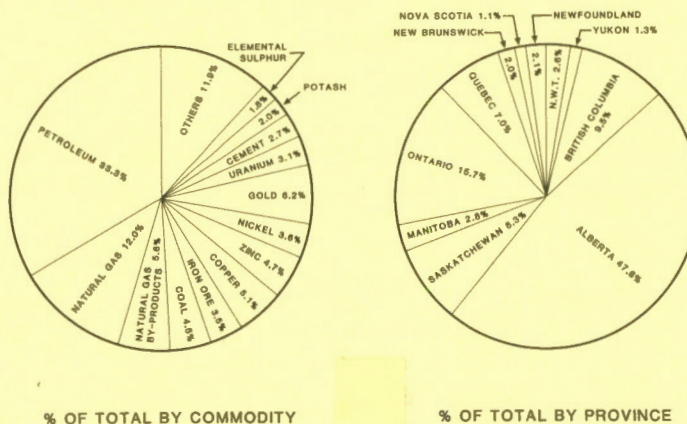
ANNUAL FIELD EXPENDITURES ON  
OFF- AND ON-PROPERTY MINERAL EXPLORATION  
IN CANADA



DAILY GOLD PRICES 1987  
AVERAGE FIXES LONDON GOLD MARKET



CANADA, MINERAL PRODUCTION, 1987



Canada

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# **THE CANADIAN MINERAL INDUSTRY**

## **MONTHLY REPORT**



**Energy, Mines and  
Resources Canada**

**Hon. Gerald S. Merrithew,  
Minister of State  
(Forestry and Mines)**

**Énergie, Mines et  
Ressources Canada**

**L'Hon. Gerald S. Merrithew,  
Ministre d'État  
(Forêts et Mines)**



## **PREFACE**

This publication is prepared in the Mineral Policy Sector of the Department of Energy, Mines and Resources. It is compiled from many sources using the best information available to us. This report is intended to be a general review of the more important current developments that affect, or may affect the Canadian mineral industry. It should not be considered an authority for exact quotation or an expression of the official views of the Government of Canada.

Mineral Policy Sector  
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## THE CANADIAN MINERAL INDUSTRY FOR MAY

The following constitutes a brief summary of the Canadian mineral industry based on information that became available in May.

### HIGHLIGHTS

1. Aluminum prices during May continued to climb, establishing a new record high on the LME of US\$1.584/lb. for high-grade aluminum (99.7%). The average price for the month was \$1.375 compared to \$1.142 in April.
2. At the end of May, it was reported that a consortium of companies is examining the feasibility of building a new 250 000 t/y aluminum smelter in Quebec. Several possible sites are being considered.
3. The World Bureau of Metal Statistics announced estimates for non-socialist copper production and consumption for 1987. Refined production was estimated to be 7.600 Mt compared to 7.446 Mt in 1986; and refined consumption was estimated at 8.034 Mt compared to 7.715 Mt in 1986.
4. Five associated Canadian gold mining companies have announced plans to merge and become the third largest gold producer in the country. The new company will have interests in eight producing gold mines in North America with an annual output of 14 500 kg.
5. The Canadian steel industry operated at 78.0% of capacity in April, down from the 83.1% rate in March.
6. The April report of the Steel Export Monitoring Programme indicated that Canadian exports of steel of Canadian origin were down 6.7% from the March total.
7. The producers' price for molybdenum remained firm at US\$3.60/lb., partly in response to strong demand and a significant drop in inventories worldwide from last year's 140 million lb. to less than 100 million lb.
8. Falconbridge Dominicana, C. por A. (Falcondo) and the Dominican Republic government signed an agreement on May 26 concerning the future operation of the Falcondo ferronickel complex. Production is expected to resume by mid-June, after having been shut down for two months.
9. A new three-year contract was reached between INCO Limited and the United Steelworkers of America covering workers at Sudbury and Port Colborne, Ontario.
10. The performance of the Canadian potash industry in 1987 showed a marked improvement over 1986. The Canadian Fertilizer Institute reported that the net loss after taxes declined from \$118.3 million in 1986 to \$22.0 million in 1987.



## ECONOMIC TRENDS

Table 1 provides a comparison of the volume of production of Canada's leading minerals. For the metals group, this table shows that lead achieved the largest percentage increase during March 1988 compared to February, with a gain of 78.7%. This was followed by silver (27.8%) and gold (19.3%). Copper and nickel also showed gains. Iron ore experienced the largest percentage drop in production during March compared to February (-16.7%).

For the first quarter of 1988, all of the leading metals showed gains over the corresponding period last year, except molybdenum and nickel. Silver had the largest percentage gain with a 46.5% increase for the quarter.

Table 2 provides information on Canada's Gross Domestic Product at factor cost in 1981 prices by industry. The data is also annualized and seasonally adjusted.

The annual rate shown for any given month is calculated by multiplying the figure for that month by twelve. It is important to note however, that if a particular month has been influenced by special factors such as a strike, the annualized data will reflect this bias.

Factor cost refers to output which is valued exclusive of excise taxes and duties, and provincial and municipal sales tax. Factor cost does however, include subsidies and other taxes which are not a function of the level of output or sale.

Seasonally adjusted data removes from time series data the effects of repetitive and clearly defined seasonal fluctuations. Such a practice permits the isolation of trends in the economy which might otherwise be obscured. Seasonal factors include such items as climate, trade practices and social institutions such as Christmas and Easter.

The GDP data is subject to ongoing revision.

GDP at Factor Cost in 1981 prices increased 0.9% in March, following a decrease of 0.2% in February and a 0.1% gain in January. Output among the services producing industries rose by 1.2%, while output of the goods producing industries increased by 0.6%. For the first quarter as a whole, the GDP increased by 0.5%.

Table 3 shows the prices of selected metals for February and March.

**TABLE 1. CANADA, PRODUCTION OF LEADING MINERALS ('000 TONNES EXCEPT WHERE NOTED)**

		1987			1988			Percentage Changes		
		February	March	Total 3 Months	February	March	Total 3 Months	March 1988 March 1987	March 1988 February 1988	1st 3 months 1988 1987
<b>Metals</b>										
Copper		56.8	67.7	184.0	62.2	67.6	195.4	-0.1	8.7	6.2
Gold	kg	7 997.9	9 095.0 <sup>r</sup>	25 211.3	9 261.8	11 053.5	29 811.9	21.5	19.3	18.2
Iron ore		1 830.0	1 836.8 <sup>r</sup>	6 178.7 <sup>r</sup>	2 657.8	2 213.1	7 052.3	20.5	-16.7	14.1
Lead		31.9	32.2	84.7	22.1	39.5	91.3	22.7	78.7	7.8
Molybdenum	t	849.1	1 540.6 <sup>r</sup>	3 492.6 <sup>r</sup>	1 047.4	966.5	2 928.4	-37.3	-7.7	-16.2
Nickel		16.1	20.4	53.9	17.1	17.4	50.5	-14.7	1.8	-6.3
Silver	t	71.2	101.2	249.6	113.0	144.4	365.7	42.7	27.8	46.5
Uranium <sup>1</sup>	t	1 050.7	1 243.9	3 682.1	1 331.2	1 329.4	3 809.7	6.9	-0.1	3.5
Zinc		102.5	115.6	291.6	99.0	98.0	299.5	-15.2	-1.0	2.7
<b>Nonmetals</b>										
Asbestos		47.7	50.9	146.7	47.6	59.2	154.0	16.3	24.4	5.0
Clay products	\$000	10 376.5	13 862.6	35 159.5	8 528.9	12 898.7	29 881.7	-6.9	51.2	-15.0
Gypsum		445.2	579.6 <sup>r</sup>	1 608.7 <sup>r</sup>	621.4	665.7	1 995.9	14.9	7.1	24.1
Potash K <sub>2</sub> O		597.8	860.7	2 064.8	764.9	781.2	2 148.9	-9.2	2.1	4.1
Cement		470.9	672.2	1 566.0	536.1	882.0	1 863.7	31.2	64.5	19.0
Lime		168.8	188.2	551.7	188.4	200.4	582.8	6.5	6.4	5.6
Salt		921.8	570.7 <sup>r</sup>	2 358.8 <sup>r</sup>	1 059.9	671.0	2 356.3	17.6	-46.1	7.5
<b>Fuels</b>										
Coal		4 580.7	4 955.1 <sup>r</sup>	14 410.4 <sup>r</sup>	5 781.2	..	..	..	..	..
Natural gas	million m <sup>3</sup>	8 366.0	9 008.0 <sup>r</sup>	27 159.0 <sup>r</sup>	10 224.0	..	..	..	..	..
Crude oil and equivalent	000 m <sup>3</sup>	6 964.0	7 774.0 <sup>r</sup>	22 540.0 <sup>r</sup>	7 920.0	..	..	..	..	..

<sup>1</sup> Tonnes uranium (1 tonne U = 1.2999 short tons U<sub>3</sub>O<sub>8</sub>).  
<sup>r</sup> Revised; .. Not available.

**TABLE 2. CANADA, REAL GROSS DOMESTIC PRODUCT AT FACTOR COST BY INDUSTRY, IN 1981 PRICES, MONTHLY  
(SEASONALLY ADJUSTED AT ANNUAL RATES)**

Industry Sector	1987	1988			Percentage Change
	March	January	February	March	March 1988 March 1987
	(\$ million)				
Total Economy	374 170.9	387 655.1	386 931.4	390 599.4	4.4
Primary Industries					
Agriculture	11 795.4	11 864.4	11 853.6	11 757.6	-0.3
Forestry	2 874.1	2 560.8	2 640.0	2 616.0	-9.0
Fishing and Trapping	721.9	548.4	564.0	536.4	-25.7
Mines, Quarries and Oil Wells	20 954.5	22 562.4	23 222.4	23 556.0	12.4
Mining Industries	7 916.5	8 522.4	8 343.6	8 522.4	7.6
Gold Mines	1 190.6	1 444.8	1 384.8	1 424.4	19.6
Iron Mines	557.4	568.8	550.8	548.4	-1.6
Other Metal Mines	4 178.3	4 179.6	4 051.2	4 164.0	-0.3
Nonmetal Mines	782.4	831.6	872.4	864.0	10.4
Asbestos Mines	116.8	184.8	165.6	158.4	35.6
Mineral Fuels					
Coal Mines	973.5	1 212.0	1 216.8	1 262.4	29.7
Crude Petroleum and Natural Gas	11 872.5	12 414.0	13 112.4	13 413.6	13.0
Secondary Industries					
Manufacturing	73 254.6	77 356.8	76 330.8	76 653.9	4.6
Non-durable Manufacturing	113.6	114.0	112.7	113.0	-0.5
Durable Manufacturing	123.5	135.8	133.8	134.5	8.9
Primary Metal Industries	5 791.7	6 328.8	6 096.0	6 207.3	7.2
Primary Steel Industries	2 255.1	2 502.0	2 406.0	2 484.0	10.3
Steel, Pipe and Tube Industry	295.1	422.4	411.6	451.2	52.9
Iron Foundries	424.0	438.0	411.6	440.2	3.8
Smelting and Refining	2 182.7	2 305.2	2 221.2	2 179.2	-0.2
Nonmetallic Mineral Products	2 372.4	2 542.8	2 461.2	2 479.5	4.5
Clay Products Industry	92.8	90.0	93.6	90.9	-2.0
Cement Industry	345.5	373.2	361.2	340.8	-1.4
Ready-mix Concrete Industry	442.7	435.6	424.8	447.4	1.1
Construction Industry	26 655.5	27 606.0	27 286.8	27 588.0	3.5
Transportation and Storage	16 471.2	17 419.2	17 115.6	17 517.6	6.3
Communications	10 698.7	11 239.2	11 341.2	11 445.6	7.0
Other Utilities	11 198.0	11 492.4	11 448.0	11 518.8	2.9
Wholesale Trade	19 915.4	21 225.6	21 028.8	21 582.0	8.4
Retail Trade	24 597.1	26 053.2	25 801.2	26 595.2	8.1
Finance, Insurance and Real Estate	53 813.7	55 114.8	55 387.2	56 031.6	4.1
Community, Business and Personal Service	38 186.5	39 117.5	39 418.6	39 579.1	3.6

TABLE 3. METAL PRICES - 1988

	February	March
<b>Copper</b>		
Electrolytic, U.S. producer f.o.b. refinery, cents (U.S.)	106.117	109.898
Electrolytic, COMEX, 1st pos. plus 5¢, cents (C.)	139.136	136.040
Electrolytic, Standard, LME cash, cents (U.S.)	102.295	103.508
<b>Lead</b>		
New York, cents (U.S.)	34.600	34.000
Montreal, cents (C.)	43.800	43.000
LME cash, cents (U.S.)	29.706	29.390
<b>Silver</b>		
New York, cents (U.S.) per troy oz.	632.475	641.283
Toronto, cents (C.) per troy oz.	829.880	826.990
LME cash, cents (U.S.) per troy oz.	631.131	637.991
<b>Zinc</b>		
St. Louis, H.G., cents (U.S.)	45.439	47.901
Montreal, Electrolytic, cents (C.)	59.500	63.000
LME cash, cents (U.S.)	39.722	44.501
<b>Tin</b>		
New York, Straits, cents (U.S.)	315.375	319.076
Metals Week, composite, cents (U.S.)	419.501	424.065
<b>Gold</b>		
London, p.m., US\$ per troy oz.	442.070	443.002
Average, (Sharps Pixley) US\$ per troy oz.	442.099	443.548
High, (Sharps Pixley) US\$ per troy oz.	455.900	458.000
Low, (Sharps Pixley) US\$ per troy oz.	426.150	429.150
<b>Mercury</b>		
US\$ per flask	353.000	345.870
<b>Nickel</b>		
Major Producer Cathode, cents (C.)	-LPS-	-LPS-
Major Producer Cathode, cents (U.S.)	-LPS-	-LPS-
LME cash, US\$	3.931	7.029
<b>Antimony</b>		
New York, dealers, cents (U.S.)	112.500	109.000
<b>Platinum</b>		
New York, refined, US\$ per troy oz.	600.000	600.000
<b>Cadmium</b>		
New York, producers US\$	4.725	8.125
<b>Aluminum</b>		
LME cash, cents (C.)	122.960	143.136
LME cash, cents (U.S.)	96.979	114.596
<b>Cobalt</b>		
Shot/cathode/250 kg., US\$	7.500	7.500
U.S. spot cathode, US\$	6.820	6.788
<b>Tungsten</b>		
LMB ore, low, US\$/MTU	49.000	51.750
GSA domestic, US\$/MTU	-LPS-	-LPS-
<b>Molybdenum</b>		
M.W. dealer oxide, US\$	3.189	3.704
<b>Uranium</b>		
Nuexco, US\$ U <sub>3</sub> O <sub>8</sub>	16.550	16.150

Average U.S. Exchange Rate for February = 1.2679, March = 1.24905.

Note: Prices are per pound unless otherwise stated.

LPS List Price Suspended.



## METALLIC MINERALS AND PRODUCTS

### Aluminum

G. Bokovay (613) 992-4093

Aluminum prices during May continued to climb, establishing a new record high on the LME of US\$1.584/lb. for high-grade aluminum (99.7%). The average price for the month was \$1.375 compared to \$1.142 in April. Despite the higher prices, the market experienced significant volatility with daily fluctuations of up to \$0.125/lb.

The International Primary Aluminum Institute (IPAI) has reported that total inventories of aluminum (including scrap, primary and secondary ingot, metal in process and finished mill products) decreased in March to 3.059 Mt from a revised total of 3.176 Mt in February. The IPAI also reported that western world average daily primary aluminum output increased in April to 36 400 t from a revised figure of 35 800 t in March.

At the end of May, it was reported that a consortium of companies including Reynolds Metals Company, Austria Metall A.G., Mitsubishi Metal Corporation, Kobe Steel, Ltd., Yoshida Kogyo KK of Japan and the Société générale de financement du Québec are examining the feasibility of building a new 250 000 t/y aluminum smelter in Quebec. Several possible sites are being considered including Sept-Iles.

Alcan Aluminium Limited announced in May that its Alcan Smelters and Chemicals Limited subsidiary would build its first metal matrix composite plant in Jonquière, Quebec. The plant, which is expected to be in full operation by mid-1989, will produce about 12 500 t of composite material and employ 30 workers. Alcan also announced that its U.S. subsidiary, Alcan Aluminium Corporation, had formed a new business venture, SyTec Enclosures Company to manufacture and market custom designed controlled environment enclosures. SyTec is a joint venture between Alcan and Divisione Sistemi Difesa e Progettazioni (DSDP) of Italy.

In early May, it was reported that the Gulf state of Qatar had invited 17 companies to participate in a new US\$1 billion aluminum smelter. The plant will have a capacity of approximately 180 000 t/y.

### Copper

W. McCutcheon (613) 992-4404

#### Metal Prices - US Cents/lb.

	London Metal Exchange (LME) Grade A Cash Settlement May 3-31	Commodities Exchange, Inc. (COMEX) 1st Position May 2-27
High	128.1	103.5
Low	99.7	91.9
Average	111.1	94.8



Between April 29 and May 27, the combined LME and COMEX stocks rose sharply from 54 350 t to 80 098 t. Prices moved dramatically on the LME due to the difficulty of obtaining nearby copper. The backwardation on the LME also varied sharply from 5.2 to 28.5 cents US/lb. in the month. The COMEX prices were less volatile, trading at a discount to the LME of between 2 and 25 cents US/lb.

Noranda Inc. will spend C\$13 million to extend the life of the Bell mine in British Columbia by two years until 1992. The mine had restarted in 1985 with an expected life of three years.

Local 22 of the Canadian Association of Industrial, Mechanical and Allied Workers, Cassiar Mining Corporation and Newmont Mines Limited met in May to discuss the tentative sale of the Similkameen division. The deadline for labour negotiations for a new contract was May 31.

The World Bureau of Metal Statistics announced estimates for non-socialist copper production and consumption for 1987, compiled from data submitted. These were:

	<u>1987</u>	<u>1986</u>
	(Mt)	
Mine production	6.471	6.448
Smelter production	6.979	6.994
Refined production	7.600	7.446
Refined consumption	8.034	7.715
Year end stocks	0.462	0.874

## Gold

D. Law-West (613) 992-4405

Five associated Canadian gold mining companies have announced plans to merge and become the third largest gold producer in the country. Shareholders of Royex Gold Mining Corporation, International Corona Resources Ltd., Galveston Resources Ltd., Lacana Mining Corporation, and Mascot Gold Mines Limited, have been asked to approve the amalgamation of their companies to form Corona Corporation. When the amalgamation is approved the new company will have interests in eight producing gold mines in North America with an annual output of 14 500 kg. Corona Corporation expects to open four new mines next year and to increase production to over 20 000 kg.

Granges Exploration Ltd. has been forced to temporarily close its gold mill at its Tartan Lake mine in northern Manitoba due to a breakdown in the mill, which is expected to be repaired by late May. At the same time, Granges is reviewing a consultant's report which recommends that the mine be operated on a reduced basis due to lower than expected ore grades. The company has not made any decision regarding the report.

Placer Dome Inc. has announced plans to amalgamate its two subsidiary operations, Kiena Gold Mines Limited and Sigma Mines (Quebec) Limited, by offering a share exchange for all outstanding shares of both companies. Each Kiena share will be exchanged for 0.92 Placer Dome common share while each Sigma share will be exchanged for 0.97 Placer share. The mines will continue to operate separately. Placer Dome, the largest gold producer in the world, outside of South Africa, is expected to produce 28 000 kg. of gold in 1988.

Government approval has been given to the Jolu joint venture project in northern Saskatchewan. The partners, Mahogany Minerals Resources Inc. (70%) and Royex Gold Mining Corporation (30%), have begun construction of a 400 t/d mill and expect to be in production before the end of the year. A \$20 million gold loan has been negotiated to cover the capital cost of the operation. Employment at the mine/mill complex will be about 100, while operating costs have been estimated at US\$170/oz. Proven and probable reserves for the project are 606 000 t grading 12.4 g/t.

## **Iron and Steel**

R. McInnis (613) 992-3784

The Canadian steel industry operated at 78.0% of capacity in April, down from the 83.1% rate of the previous month. The capacity of the Canadian steel industry on January 1, 1988 was 19 212 802 t.

The 'Steel Export Monitoring Programme', April report indicated that Canadian exports of steel of Canadian origin totalled 252 667 t, down 6.7% from the March total of 270 703 t. Compared to U.S. figures for April last year, exports have declined 9%.

A tentative contract agreement has been signed between The Algoma Steel Corporation, Limited of Sault Ste. Marie, and the United Steelworkers of America union. Ratification meetings with the 7 000 employees involved are scheduled for early June.

Dofasco Inc. has announced that it is proceeding with engineering work on an integrated cold mill complex at its plant in Hamilton, Ontario. An agreement was signed with Nippon Kokan KK for engineering work over the next year. The new facility will use the latest technology and incorporate a coupled pickle line/tandem cold rolling mill and a continuous annealing line. The facility will be capable of processing sheets suitable for electro-galvanizing and other new products under consideration. If the project gets final approval, completion would be scheduled for mid-1991. A second cast-slab system is under consideration. If both projects are implemented, Dofasco's capital investment over the next five years would increase to \$1 billion.

IPSCO Inc. of Regina, Saskatchewan announced record first quarter earnings of \$11.3 million. Improved sales were attributed to a resurgence in demand for oil industry products and high demand for flat rolled steel. Profitability improvements were attributed to a reduction of non unionized staff, a salary freeze and the new continuous caster that came on stream last year.

Modernization at Sydney Steel Corporation (Sysco) in Sydney, Nova Scotia is progressing, a contract to supply and erect structural steel for a new rail mill and melt shop operation was awarded to Marshall Steel Limited of Laval, Quebec.

LTV Steel Company of Cleveland has signed a contract to sell one of its steel plants and some other business interests to Renco Group Inc. of New York. The steel plant in Warren, Ohio, has one blast furnace, one electric arc furnace and a basic oxygen furnace, with a production capacity of 1.8 Mt/y.

## **Iron Ore**

B. Boyd (613) 992-3731

CVG Ferrominera Orinoco C.A. the major Venezuelan iron ore producer, is investing US\$45 million to increase production capacity from 18 to 24 Mt/y, and to build a 2 Mt/y pellet plant by 1990.

## **Molybdenum**

D. Fong (613) 992-3951

The producers' price remained firm at US\$3.60/lb., partly in response to the strong demand and the significant drops in inventories worldwide from last year's 140 million lbs. to less than 100 million lbs. Meanwhile, the merchant price fell from a high of US\$4.40 in March to the current producers' price, an indication of the growing control of the producers over molybdenum markets.

Among the major producers, Noranda Inc. is reported to be running low on inventories and Cyprus Minerals Company is expected to eliminate its inventories by July despite its recent increase in production from its Thompson Creek mine in Idaho.

AMAX Inc. said it has no immediate plan to boost its output at the Henderson mine despite the strong molybdenum market. AMAX planned to produce 18 million lbs. of molybdenum in 1988 out of a total capacity of 65 million lbs./yr.

Cyprus Minerals planned to obtain the approval from the Federal Trade Commission and the U.S. Justice Department for its acquisition of the Tonopah mine from ARCO Coal Corporation. If approved, the company intends to operate the Tonopah mine the same way as the Thompson Creek mine by dividing the workers' time between mining and milling in order to lower production costs. The acquisition could solidify Cyprus Minerals position as a leading supplier in the molybdenum market.

## **Nickel**

R. Telewiak (613) 992-4481

Falconbridge Dominicana, C. por A. (Falcondo) and the Dominican Republic government signed, on May 26, an agreement concerning future operation of the Falcondo ferronickel complex. A key component of the agreement will be that Falconbridge Dominicana will pay a minimum tax of US\$17¢/lb. of nickel exported, as well as a tax based on profits. For the first 60¢/lb. of profit the tax will be 33% and for all profit above that amount, the rate will be 55%. The profits will be calculated by subtracting costs which will be determined under a set formula and the price of nickel on the London Metal Exchange.

About 20 million lbs. of nickel is stockpiled at the plant and can be delivered as soon as ships are available. Production is expected to resume by mid-June, after having been closed for two months. Since mid-December 1987, ferronickel shipments have been restricted to 10 million lbs. of contained nickel while negotiations between the company and government were under way.

A new three-year contract was reached between INCO Limited and the United Steelworkers of America covering workers at Sudbury and Port Colborne, Ontario. The previous three-year contract expired on May 31. The contract provides for wage increases of 22% over the life of the agreement. Most workers will also receive a bonus next month of \$2080 due to a new formula for wage increases. An important element of the agreement is that pensions will be indexed to approximately 80% of the inflation rate.

In late May, INCO agreed in principle to sell 20% equity interest in P.T. International Nickel Indonesia to Sumitomo Metal Mining Co. Ltd. for US\$100 million. The sale is expected to close in about two months.

In addition, INCO and Sumitomo agreed to expand the production capacity of the Sulawesi complex from 80 million lbs. to 105 million lbs. The expansion is expected to be completed in two years. Sumitomo will purchase about 20% of the plant's annual production.

As a result of the settling of the Falconbridge Dominicana dispute and the signing of the new contract at Sudbury, the price of nickel on the London Metal Exchange fell late in the month. On May 31 the price was US\$6.76, compared to the average for May of \$7.75.

### **Titanium**

D. King (613) 992-3733

Opposing factors will affect the demand for titanium metal over the next year or so. Aging fleets of commercial aircraft, requiring titanium in engine and airframe parts, will need to be replaced. In this respect, large aircraft orders have been placed with firms such as Boeing and the EC Airbus consortium. Prices for semi-fabricated titanium alloys have been gradually rising as a result of this demand and also because of the substantial increases in the price of vanadium and aluminum, which are used as alloying elements with titanium. The increasing cost of these traditional alloying elements could be partially offset if a new series of titanium alloys, developed by Nippon Steel Corporation (NSC) and Toho Titanium Co. Ltd., become widely used. These new titanium alloys contain the relatively cheap alloying elements iron, oxygen and nitrogen, and retain high corrosion resistance with a superior strength-ductility balance.



## INDUSTRIAL MINERALS AND PRODUCTS

### Graphite

M. Boucher (613) 992-3074

Metallurgical tests on a graphite ore deposit located south of Mont Laurier, Quebec, have recently been conducted by the Centre de recherches minérales on behalf of Stratmin Inc. In all, 98.6% of the graphite flakes were recovered, and close to 54% of the graphite is in the 150 micron category. Le Groupe Sidam-Minorex, an independent mining consultants firm, indicates that this last percentage can be substantially increased through industrial processing of the mineral.

Stripping and drilling activities are currently under way in order to study the mineralization of new conductors.

### Potash

G. Barry (613) 992-7568

#### Potash Corporation of Saskatchewan

The Potash Corporation of Saskatchewan (PCS) announced that it will close the production of pink potash product at its Cory mine. The company is scheduling maintenance shutdown from July 17 to August 13. After resumption only white product from its crystallized units will be produced.

The mine and surface employment will be scaled down to about 100 from the current 300. The potassium sulphate plant will be closed also.

Underground work will be limited to one shift with two mining machines at work, sufficient to produce ore for the production of about 200 000 t/y of premium product grading 62.4% K<sub>2</sub>O. The partial closure of the Cory mine will continue indefinitely, probably until world supply-demand balance improves sufficiently in the early 1990s.

#### The Industry

The performance of the Canadian potash industry in 1987 showed a marked improvement over 1986. The Canadian Fertilizer Institute survey of financial and other information reported that the net loss after taxes declined from \$118.3 million in 1986 to \$22.0 million in 1987. All but one company which did not reach full production capability, are included in the survey. Results are as follows:

	<u>1987</u>	<u>1986</u>
	(\$000)	
Sales	668 601	525 980
Cost of Sales	449 522	433 057
Gross Profit	189 079	92 923
Marketing and Administration Expenses	135 126	153 411
Interest Costs	55 396	57 323
Income Taxes	20 584	453
Net Profit (Loss)	(22 027)	(118 264)



The industry's capital expenditures declined to \$46.3 million in 1987 from \$136.8 million in 1986. The rate of return on investment improved dramatically to 2.92% in 1987 from a negative (3.22%) in 1986.

## **SPECIAL ITEMS**

### **Advanced Industrial Materials**

A. Werner (613) 992-7613

#### **A. New Facilities for Research in Ontario**

The Ontario Centre for Materials Research (OCMR), with administrative offices in Kingston, is one of seven "Centres of Excellence" recently established by the Government of Ontario to spur competitive research in materials of economic importance to the province.

OCMR can provide seed money for new research initiatives and will fund a limited number of scholarships for graduate students. It has already created university-industry networks and plans to organize workshops to disseminate knowledge about advanced materials. Several project areas have been designated for funding.

Investigations on **biomaterials**, particularly for use as implants, are centred at the University of Toronto.

Studies into **microstructural optimization** are based at McMaster University. This field includes examination of the behaviour of ceramics and glasses, the development of new crystalline materials, alloys and metal matrix compounds, and the use of new techniques of welding and casting.

Work on **polymers and composites**, such as studies of different polymer blends and alloys, fibre-reinforced polymers and carbon/carbon composites, is being carried out at the University of Toronto, Queen's University and the University of Waterloo.

Studies of **opto-electronic materials** and their production through the use of techniques such as ion implantation, laser processing and the use of optical waveguide materials are being coordinated through McMaster University.

Investigations of **interface science and technology**, including studies of chemical vapour deposition, synchrotron radiation and particle beams, are centred on the University of Western Ontario.

Further information on OCMR and its projects may be obtained from:

Peter McGeer  
Managing Director  
P.O. Box 1146  
Kingston, Ontario  
K7L 4Y5  
(613) 545-6519

## B. New Metal Matrix Composite Plant in Quebec

Alcan Smelters and Chemicals Limited, a subsidiary of Alcan Aluminium Limited, is to build its first metal matrix composite plant in Jonquière, Quebec.

The plant will have an annual capacity of 12 500 t of composite and will employ some 30 people. Construction will get under way soon and it is expected that the plant will be in full operation by mid-1989.

## C. New Business Unit for INCO's Metal Powders

INCO Limited has announced the formation of INCO Specialty Powder Products as a separate business unit to manage operations related to a series of nickel powders and other powder products. The unit will be responsible for worldwide sales, technical market development, research programs, and the supply of powder from three production facilities.

These specialty powder products have market applications in fast-changing technologies, such as powder metallurgy steel parts, conducting and electronic applications, batteries, electromagnetic shielding, special paints and pigments, automotive catalysts, nickel-coated powder uses, and high-purity nickel oxide applications.

## Cash Operating Costs of Gold Mines in Canada, 1986

A. Lemieux (613) 992-2709

Public knowledge about mine-by-mine gold production costs in Canada in 1986 is more detailed than usual because of corporate disclosure of 1986 financial data in support of numerous mergers and acquisitions in 1987.

In 1986, there were 45 mines in Canada whose sole or most valuable product was gold. They accounted for about 85% of Canada's total gold production, the remainder coming from by-product and placer gold.

Their cash operating costs in 1986 ranged from C\$129 (US\$93) to C\$563 (US\$405) per troy ounce, averaging C\$282 (about US\$200). The average trading price of gold on the London Metal Exchange in 1986 was C\$511 (US\$368) per ounce.

These 45 gold mines produced some 88 t of gold in 1986, in cash production-cost ranges (\$/oz.) as follows:

1986 Production		at	Cash Production Costs
(t)	(oz.)		(per oz.)
16	(511 000)		C\$129-200 (US\$ 93-144) <sup>1</sup>
37	(1 181 000)		C\$200-300 (US\$144-216)
24	(779 000)		C\$300-400 (US\$216-288)
11	(350 000)		C\$400-500 (US\$288-360)
0.5	(15 000)		C\$500-563 (US\$360-405)

Source: Resource Evaluation Division, EMR.

<sup>1</sup> Average 1986 exchange rate.

## **The Role of Ferrous Scrap in Canadian Steel Production**

R. McInnis (613) 992-3784

The Canadian steel industry is a major industry with an annual capacity of almost 19 Mt. It employs over 45 000 people and its annual production is valued at about \$7.0 billion. Approximately 50% of the iron units used by the Canadian iron and steel industry come from scrap.

The producers of ferrous scrap describe unprocessed scrap by its origin. There are three types: home (own-generated) scrap produced in the manufacture of steel mill products; prompt industrial scrap generated by the secondary manufacturing industry in its production process; and obsolete scrap produced from discarded machinery, equipment and structures.

Scrap has always been an important raw material input to the steel industry. Today it is even more important, because of technological changes and environmental considerations.

The first technological change that had a major impact on the scrap market was the development of the electric furnace steel industry. In 1976, 16% of Canadian steel was produced in electric furnaces; in 1987, 30%. This growth is expected to continue. Almost all of the iron units used by electrical furnaces come from scrap.

The second major technological change was continuous casting, a process whereby molten steel is cast directly into semi-finished shapes such as billets and slabs, eliminating the ingot casting-roughing mill stage previously required, and significantly increasing yield. That is, a higher percentage of the molten steel becomes steel mill products, often over 10% more. The use of this process reduces the amount of scrap generated during the steelmaking process. Since the typical oxygen steel furnace can use up to 30% scrap in its charge, and since most steel plants maximize scrap usage because of price considerations, the change to continuous casting has resulted in increased demand for purchased scrap.

A third, and recent, significant change has been a tightening in the availability of coke, which is partly a result of environment protection legislation. Coke is both a fuel and a reductant in the blast furnace. It is made in a coke oven from a special grade of coal by heating and driving out the volatile elements. Coke is close to pure carbon. The current shortage of coke is due predominantly to the closure of many steel mills, and their attendant coke ovens. Coke ovens are very expensive to build, especially the equipment that is needed to meet environment protection regulations. To put this cost into perspective, the coke ovens would represent over one third of the capital cost of a new blast furnace operation.

Although the above factors contributed to the gradual increase in demand and price of scrap, an important recent reason was a significant growth in North American steel production.

The cost and availability of scrap are critical in determining the share of the market held by the integrated and electric furnace mills. The cost of making liquid steel by these competitors is approximately equal when the cost of ferrous scrap is US\$130/t.

The main characteristics of these two ways of producing steel is briefly described in the following paragraphs.

### **Integrated Steel Mill**

This type of plant uses iron ore and coking coal feedstocks. The first step is the coke making. Coke is used as a reductant and to provide the energy to operate the 'Blast Furnace'. A blast furnace is a shaft furnace where coke, iron ore and limestone (flux) are added at the top and



preheated air is blown in at the bottom. The burning coke reduces and then melts the iron ore to produce molten pig iron, which is tapped from the bottom below the air blasts. The molten iron, which is saturated with carbon, is charged to a steel furnace where the carbon is removed by the injection of oxygen. Scrap is also charged to the steel furnace where it is melted by the energy liberated by the oxidation of the carbon. Up to 30% of the charge can be scrap and some newer designs of furnace allow higher percentages. At the end of this operation the furnace is filled with molten steel.

### Electric Furnace Mill

The process of producing molten steel begins with the charging of scrap to a furnace where it is melted by energy from an electric arc. Scrap used in the electric furnace is carefully selected to minimize the melting time, which determines the cost of energy per tonne of steel. Virtually all of the steel produced in electric furnace mills come from scrap (Sidbec-Dosco Inc. uses direct reduced iron in addition to scrap). At the end of the cycle, the electric furnace mill also has a furnace full of molten steel.

The two approaches to making steel have a number of relative advantages and disadvantages which are illustrated as follows:

#### INTEGRATED STEEL MILL

##### Advantages

- Stable and predictable input costs
- High quality products
- Wide product range
- Flexibility in scrap consumption
- Efficient at high utilization rates

##### Disadvantages

- High capital cost
- Needs large market
- Carries large inventories
- Needs highly skilled labour force

#### ELECTRIC STEEL MILL

##### Advantages

- Low capital cost
- Low energy requirement
- High productivity (man-hours/tonne)
- Caters to small, local markets

##### Disadvantages

- Limited control over input costs and quality
- Tramp elements in scrap limit product line
- Limited product range
- Quality of steel can vary from batch to batch

The demand, supply and price of ferrous scrap is cyclical and, historically, there have been wide swings in price. Scrap is currently at the high end of the pattern of price movements, and some decline is expected in the future. However, significant changes in the supply side, as discussed in this article, will likely result in smaller price declines than have occurred in past cycles. The factors that will affect future markets for ferrous scrap are being closely followed by many concerned people in the industry.



## **NEW PUBLICATIONS**

### **Yearbook**

The following publication was published by Energy, Mines and Resources Canada and copies can be obtained from:

Canadian Government Publishing Centre  
Supply and Services Canada  
Ottawa, Canada  
K1A 0S9

Mineral Report 36 – Canadian Minerals Yearbook 1987 – Review and Outlook

This 101st edition reports on the activity of the mineral industry during 1987.

Reference: Cat. No. M38-5/36E  
ISBN 0-660-12796-2  
Price: \$39.95

### **Statistical Review of Coal in Canada – 1987**

This publication was also produced and published by Energy, Mines and Resources Canada and can be obtained from:

Publications Distribution  
Mineral Policy Sector  
Energy, Mines and Resources Canada  
580 Booth Street  
Ottawa, Ontario  
K1A 0E4



