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Electronic Materials

Research and development expenditures in the field of electronic materials totalled \$2.9 million in 1987. New process technology is being developed for the purification of arsenic and gallium to special grades optimized for gallium arsenide production. Major efforts continue to be focused on the improvement of technology for the manufacture of compound semiconductors including gallium arsenide, cadmium telluride, and cadmium mercury telluride. As a result of a program to develop epitaxial

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Cominco Electronic Materials successfully completed Canada's first industrial experiment in space in 1987. A rocket launched from the Swedish Space Corporation's Esrange facility contained cadmium mercury telluride samples for crystallization experiments under near zero gravity conditions.

Research and development continued on rapid solidification casting and powder metallurgical processing methods.

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to extend capabilities into the field of advanced optical materials which are finding increasing application in high technology products. Crystar is producing the first large synthetic sapphires grown in Canada, with optical quality crystals weighing up to 20 kilograms.

The Electronic Materials operations located in Trail, those of Cominco Electronic Materials Incorporated in Spokane, and Crystar Research Inc. had 42 employees directly engaged in research and development activities at year-end.

Production and Sales Statistics

Twelve Months Ended December 31

		1987		1986	
		Sales	Production	Sales	Production
Refined Metal					
Zinc					
Trail	tons	218,100	210,300	265,800	266,900
Tolled — Polaris	tons	—	—	7,400	5,700
		218,100	210,300	273,200	272,600
Lead					
Trail	tons	83,200	87,700	123,500	122,300
Silver¹					
	ounces	7,596,600	7,615,000	8,709,500	8,810,000
Gold					
Highland Valley Copper (55%)	ounces	3,700	3,700	900	800
Con	ounces	—	—	88,200	88,300
Trail	ounces	38,900	38,800	21,400	21,400
Buckhorn	ounces	27,800	28,000	28,500	29,300
		70,400	70,500	138,900	139,800
Concentrates²					
Zinc					
Sullivan	tons	—	144,800	—	176,200
Polaris	tons	221,800	227,100	181,400	200,700
Magmont	tons	11,900	12,000	10,800	10,800
Pine Point	tons	13,200	533,000	—	457,800
		246,900	916,900	192,200	845,500
Lead					
Sullivan	tons	—	115,800	—	127,600
Polaris	tons	36,500	37,000	40,000	35,300
Magmont	tons	52,800	49,500	56,400	56,800
Pine Point	tons	164,900	163,300	156,100	163,800
		254,200	365,600	252,500	383,500
Copper³					
Highland Valley Copper (55%)	tons	95,000	95,000	43,000	43,000
Valley	tons	—	—	23,500	22,500
Magmont	tons	1,400	1,000	1,000	900
		96,400	96,000	67,500	66,400
Molybdenum³					
Highland Valley Copper (55%)	tons	1,700	1,700	1,100	1,200

¹Includes silver sold in concentrates and intermediate products.

²Sales tonnages exclude concentrates processed at Trail and concentrates tolled through other smelters which are reported as refined metal sales.

³Tonnages are for metal contained in concentrate.

Mining and Integrated Metals

Revenues and Operating Profit (Loss)

	Revenues		Operating Profit (Loss)	
	1987	1986	1987	1986
	(millions)			
Trail Metallurgical Operations	\$330	\$356	\$ 22	\$ (10)
Sullivan Mine	65	63	14	(3)
Pine Point Mines	110	96	35	5
Polaris Mine	89	80	21	16
Magmont Mine	38	25	18	7
Con Mine ¹	—	44	—	6
Buckhorn Mine	18	16	3	4
Valley Mine ²	—	35	—	2
Highland Valley Copper ²	198	59	79	1
Cominco UK	2	2	1	—
Metals Operations Overhead	—	—	(5)	(7)
	\$850	\$776	\$188	\$ 21
First Quarter			\$ 27	\$ (6)
Second Quarter			30	(8)
Third Quarter			43	9
Fourth Quarter			88	26
			\$188	\$ 21

¹The Con Mine was sold in December 1986

²Valley Mine operated from January 1, 1986 to June 30, 1986 and Highland Valley Copper partnership from July 1, 1986 to December 31, 1987.

Gold and Silver

Gold and silver prices advanced strongly in 1987 as the U.S. dollar declined further due to concern about inflation and the U.S. debt. The price of gold peaked at U.S.\$503/oz. in mid-December and averaged U.S.\$446/oz. for the year, up from U.S.\$368/oz. in 1986.

The price of silver showed a rising trend during the year in response to the rising gold price. In April a speculative surge moved the price briefly to levels above U.S.\$10.00/oz. Silver prices averaged U.S.\$7.01/oz. in 1987 compared with U.S.\$5.57/oz. in 1986.

Trail Metallurgical Operations

The integrated smelter and refining complex at Trail, B.C. produces a wide range of metals, principally refined zinc, lead, silver and gold. Annual production capacity is 300,000 tons (272,000) of refined zinc and 135,000 tons (122,500) of refined lead. Over half of Cominco's Canadian-mined zinc and lead concentrates are refined at Trail, with the balance made up through the purchase of custom concentrates.

Electrical power from Cominco's two hydro-electric generating plants serves the operations in Trail and Kimberley and any surplus is offered for sale to West Kootenay Power and Light Company, Limited and to other public utilities.

Construction of the new lead smelter and an air separation plant to supply it with oxygen progressed favorably during 1987 and startup of the smelter is planned for mid-1989.

A \$15 million project to upgrade the Zinc Operations' zinc solution purification capability is continuing. Completion of construction is scheduled for December 1988.

A \$14 million project to build a plant for the production of copper sulphate and copper arsenate is well advanced. Copper sulphate production is expected to begin in the spring of 1988 and copper arsenate production in mid-1989. Copper sulphate is an important reagent in the mineral processing industry and copper arsenate is used in the manufacture of chromated copper arsenate, a wood preservative. The production of copper arsenate will create further environmental improvements in the processing of zinc and lead concentrates.

There was a significant turnaround in earnings from metallurgical operations as a result of improved prices for zinc, lead and silver together with improved productivity and reduced unit operating costs for both zinc and lead. While sales were severely affected by a 17-week strike, stand-by costs during that period were covered by sales of excess electric power.

Production of Refined Metals			
		1987	1986
Zinc	tons	210,300	266,900
	(tonnes)	(190,800)	(242,100)
Lead	tons	87,700	122,300
	(tonnes)	(79,600)	(110,900)
Silver	ounces	6,418,000	7,939,600
	(kg)	(199,600)	(247,000)
Gold	ounces	38,800	21,400
	(kg)	(1,200)	(666)
No. of employees at year-end		2,629	2,291

Sullivan Mine

The Sullivan Mine at Kimberley, B.C. has been in operation since 1909. From that date it has been the principal supplier of zinc and lead concentrates to Trail.

Operations were shut down for 17 weeks as the result of a strike, and mill throughput was reduced by 25 per cent compared with 1986.

A project to expand the flotation circuit in the concentrator will be completed in September 1988. This increased capacity will allow the addition of some lower grade material to the regular mill feed on an incremental basis, and thus, some marginal mineralization will be turned into ore over the next few years.

		1987	1986
Ore Milled	tons	1,393,700	1,859,000
	(tonnes)	(1,264,400)	(1,687,000)
Zinc	Average ore grade	6.0%	5.5%
	Concentrate tons	144,900	176,200
	(tonnes)	(131,400)	(159,800)
Average concentrate grade	Lead	48.4%	49.3%
	Lead	6.3%	5.3%
Concentrate tons	Average ore grade	115,800	127,600
	(tonnes)	(105,100)	(115,700)
Average concentrate grade	grade	61.3%	62.0%
	Silver		
Average ore grade	Oz./ton	1.9	1.4
	(g/tonne)	(59)	(48)
No. of employees at year-end		855	827

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