

Nickel

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(Abbreviations used in this article include: ^e Estimated; ^f Forecast; ^P Preliminary; Ni = nickel; FeNi = ferronickel; LME = London Metal Exchange; conc. = concentrate. Production data are for January to September 2002 unless otherwise noted; data in brackets are for the same period in 2001.)

2001 production: \$1.8 billion^P

World rank: Third

2001 exports: \$1.7 billion

Canada	2001	2002 (e)	2003 (f)
	(000 tonnes)		
Mine production	194	182	190
Refined production	141	145	148
Use	11	11	12

(e) Estimated; (f) Forecast.

Nickel's resistance to corrosion, high strength over a wide temperature range, pleasing appearance, and suitability as an alloying agent make it useful in a wide variety of applications. Markets for primary nickel include stainless steel (64%), nickel-based alloys, electroplating, alloy steels, foundry products, batteries, and copper-based alloys. Nickel is intensively recycled; between 45% and 48% of nickel used to make stainless steels is in the form of stainless steel scrap.

ANNUAL AVERAGE SETTLEMENT PRICES, LONDON METAL EXCHANGE

1998	1999	2000	2001	2002 (e)
(US\$/t and US\$/lb)				
4 617	6 015	8 641	5 948	6 795
2.09	2.73	3.92	2.70	3.08

(e) Estimated.

CANADIAN OVERVIEW

- January-September mine production = 139 200 t (139 700 t); January-September refined production = 106 200 t (100 600 t).
- Falconbridge's Sudbury** operations produced 21 200 t (17 000 t) of Ni in conc. and 39 700 t (39 100 t) of Ni in matte. The **Raglan** mine produced 17 500 t (18 200 t) of Ni in conc. Falconbridge is considering using Inco's idle **Victor** shaft to access Nickel Rim South where exploration showed inferred resources of 4.6 Mt grading 2.2% Ni and 4.9% Cu plus precious metals. A feasibility study for the **Montcalm** property near Timmins, Ontario, is expected by the first quarter of 2003 and mining could start in 2004; the capacity is to be 8000 t/y.
- Voisey's Bay:** **Inco** and the Province of Newfoundland and Labrador reached an agreement allowing the development of the Voisey's Bay orebody. Infrastructure work began in 2002, construction is to start in 2003, and initial mine production is scheduled for 2006. Concurrent with mine development, Inco will continue R&D work on a new hydrometallurgical process for treating sulphide nickel-cobalt conc. A legal agreement between Inco and the Province was concluded on September 30 and is available on the Internet.¹
- Inco's Sudbury** operations did not shut down for a summer vacation. Inco put the **Victor Deep** project on indefinite hold after the initial Voisey's Bay agreement was announced. In **Thompson**, workers negotiated a new contract in September. Production did not meet target in Thompson due to concentrate blending and mine production problems.
- Sherritt International** owns 50% of the **Metals Enterprise JV** with **Cubaniquel**; they operate a refinery at Fort Saskatchewan, Alberta, and a mine and leach plant at Moa Bay in Cuba.

¹ The 14.9-Mb document detailing the agreement between Inco Limited and the Province of Newfoundland and Labrador can be found on the Internet at www.sedar.com/csfsprod%2Fdata33%2Ffilings%2F00485302%2F00000001%2Fe%3A%5CINCO%5C2002%5C8Koct8.pdf.

- At **Canmine's** hydrometallurgical refinery at Cobalt, Ontario, commissioning of the autoclave was completed in April. Financial problems interrupted the ramp-up; the refinery was put on care and maintenance in August. Canmine continued its restructuring and refinancing program into late 2002.
- **North American Palladium's** new 15 000-t/d expansion had crusher problems; the new mill averaged 13 500 t/d of ore during the year. Production of by-product Ni from January to September was 893 t (462 t).
- **LionOre Mining International** has no Canadian operations but has become a significant Ni producer. LionOre purchased **Anglo American's** 43% of **Tati Nickel** in Botswana, increasing its ownership to 85%. In addition, LionOre acquired Anglo's interests in **BCL**, which operates Ni-Cu-Co mines and a smelter in Botswana. The Tati expansion of the **Phoenix mine** reached full production by late November with annualized payable production at 12 500 t/y of Ni; the **Selkirk mine** exhausted its ore reserves in September. Tati's concentrates are smelted at **BCL**, also in Botswana. The BCL smelter was shut down in April for repairs after furnace problems. Matte from BCL is refined at **Nikkelverk** and **Empress**, and the problem affected those refineries. In Australia, LionOre's **Emily Ann mine** started up in the first quarter of the year and commissioning was completed in June. Output for 2002 is scheduled at 5700 t of payable Ni; thereafter, 6700 t/y payable. Inco purchases the conc. and has it smelted at WMC.
- withdrawal from nickel; besides selling Australian properties, Outokumpu's Norwegian mine, **Nikkel og Olivin**, was shut in October after exhausting its ore reserves.
- **China: Jinchuan Nickel** sought new feed sources for its 50 000-t/y facility; it is forecast to produce 55 000 t in 2003. Jinchuan will take the entire output of **Sally Malay** in Australia, or 8000 t/y of Ni in conc., starting in 2004. **Titan** and Jinchuan will form a joint venture to apply Titan's BioHeap™ process to Jinchuan's ore.
- **Oceania: In Indonesia, PT Inco** will produce 59 000 t of Ni in matte in 2002; furnace #3 was shut down for relining. **Inco's Goro** project in New Caledonia is under construction, albeit delayed. Costs for the 55 000-t/y Ni, 4500-t/y Co high-pressure hydrometallurgical leach project may rise 15% from US\$1.45 billion and start-up could be delayed until 2005. Inco secured tax holidays and concessional financing for its project. **BRGM** will sell its 15% share in Goro to Inco, and Inco will sell 25% to a **Sumitomo**-led consortium. Inco said also that 5% will go to New Caledonia and 5% to the South Province of New Caledonia. Also in New Caledonia, Falconbridge began a bankable feasibility study on the **SMSP-Falconbridge Koniambo** FeNi project; a decision on the US\$1.5 billion project to produce 60 000 t of Ni in FeNi is expected in early 2004. If Koniambo proceeds, it will receive tax concessions similar to Goro; possible start-up would be in 2007. **Norilsk** bought into the Nakety project of **Argosy Minerals** but declined to proceed after studying the matter further. **Coral Bay Nickel** in the **Philippines** will start up in mid-2004; an acid pressure leach plant will produce 10 000 t/y of Ni and 800 t/y of Co in intermediates using stockpiled low-grade ore. Sumitomo is expanding its refinery in Japan to handle the additional output.

WORLD OVERVIEW

- **Norilsk** released production data for the first time since 1996. Recent Ni production was: in 2001, 223 000 t; in 2000, 217 000 t; and in 1999, 209 000 t. Recent Co production was: in 2001, 4600 t; in 2000, 4100 t; and in 1999, 4000 t. Norilsk may release mineral reserves data before year-end. Norilsk used 60 000 t of nickel as collateral for a US\$200 million loan for three years.
- **Titan Resources** closed its **Radio Hill** mine in September after depleting economic reserves. **Tectonic Resources** extended operations at **RAV 8** from July to December by finding more ore. **Jubilee Gold** continued developing an underground mine to replace the **Cosmos** open pit, which is to be mined out in 2003; the new **Cosmos Deeps** mine is expected to last until 2007, producing 10 000 t/y of Ni in conc. Inco purchases the Cosmos conc. and smelts it in Canada. Effective July 1, **Outokumpu** sold its **Black Swan** mine and **Honeymoon Well** property to a consortium owned by **MPI** and **OMG**. Outokumpu continued its

NINE-MONTH NICKEL PRODUCTION⁽¹⁾

Operation	Jan.-Sept. 2002	Jan.-Sept. 2001	Comments
(000 t)			
LATERITE ACID PRESSURE LEACH PRODUCTION			
Anaconda Nickel	23.2	19.3	Restructuring and recapitalizing; production < 70% capacity.
Metals Enterprise	23.4	21.1	JV of Sherritt International and Cubaniquel.
OMG (Cawse)	?	?	Refinery closed after OMG purchased it; 2002 data not released.
Preston (Bulong) (6 months)	3.3	3.4	Creditors own 95% of Bulong after August 29.
AMMONIA PRESSURE LEACH PRODUCTION			
Yabulu refinery	22.5	21.4	Expansion to 70 000 t/y for Ravensthorpe output under study.
Cubaniquel (6 months)	20.6	20.2	Two operations producing Ni oxide sinter.
Tocantins (6 months)	10.0	9.5	Expansion under way to 18 000 t/y by 2003; increase to 21 000 t/y by 2004 may be delayed by power costs.
OTHER PRODUCTION OF FINISHED NICKEL			
MMC Norilsk Nickel	?	?	Forecast 217 000 t of production in Jan-Dec. 2002 due to furnace modernization at Nadezhda smelter; production was 223 000 t in Jan.-Dec. 2001.
Inco Sudbury	77.1	67.1	Includes U.K. output (U.K. averaged 2800 t/month in Jan.-Dec. 2002). Production for Jan.-June 2002 was 18 600 t (17 700 t).
Inco UK (6 months)			
Inco TNC	49.4	45.4	Finished Ni output from Inco's share of PT Inco; some reprocessed at Taiwan Nickel and Korea Nickel.
	*	*	
Inco Thompson	32.7	36.3	Includes imported concentrates from Australia.
WMC	47.8	44.3	Fire at smelter reduced feed to refinery.
Nikkelverk (Falco)	47.2	48.3	Feed limited by problems at BCL and by Sudbury mine output.
Sumitomo	24.5	?	Expansion for Coral Bay feed (10 000 t/y) in mid-2004.
Empress	4.9	5.0	Feed shortage due to problems at BCL.
OMG (6 months)	27.0	27.0	Matte from Outokumpu and Fortaleza; intermediates from Cawse.
Sandouville (6 months)	7.1	7.6	Processes matte from New Caledonia to metal and chemicals.
Anglo Platinum (6 months)	9.4	9.2	PGM expansion under way that will also raise by-product Ni output.
Lonmin	?	?	About 1600 t/y as Ni sulphate sent to Anglo Platinum.
Impala	?	?	Produces about 7000 t/y from own mines plus 7000 t/y tolled.
Bindura	?	?	Major furnace rebuild needed by late 2002; capacity 15 000 t/y.
Jinchuan	?	?	Jan.-Dec. 2001 production about 50 000 t; new feed sources sought.
Chengdu	?	?	Refines matte produced at Jilin Nickel; capacity about 5000 t/y.
Ni IN FeNi PRODUCTION			
Japan	55.5	??	Production of Huyuga, Pacific Metals and Nippon Yakin.
Cerro Matoso	33.1	28.1	Ramp-up completed; planned capacity 55 000 t/y.
Falcondo	17.2	19.2	Cutbacks; labour contract up Nov. 30.
Larco	14.3	13.6	Imported some ore from Albania and Turkey in 2001.
PT Antam	6.0	6.9	Financing for expansion to 25 000 t expected in 2003.
Loma de Niquel	7.5	3.6	Ramp-up to be completed by year-end; planned capacity 17 000 t/y.
Eramet (6 months)	24.2	23.2	US\$65 million expansion to 75 000 t/y by 2005 approved.
Codemina (6 months)	2.9	3.1	Power rationing instituted in 2001.
Feni-Mak (6 months)	2.5	0.4	Target production of 6000 t for 2002.
Ferronikel Kosovo	??	??	Believed to be inoperative.
Pobuzhsky	??	??	Imported 500 000 t laterite ore (about 8000 t Ni) from SMSP.
Russian FeNi	??	??	Rezh, Yuzhuralnikel, Ufaleynickel also produce some Ni metal; combined production estimated at 25 000 t/y.

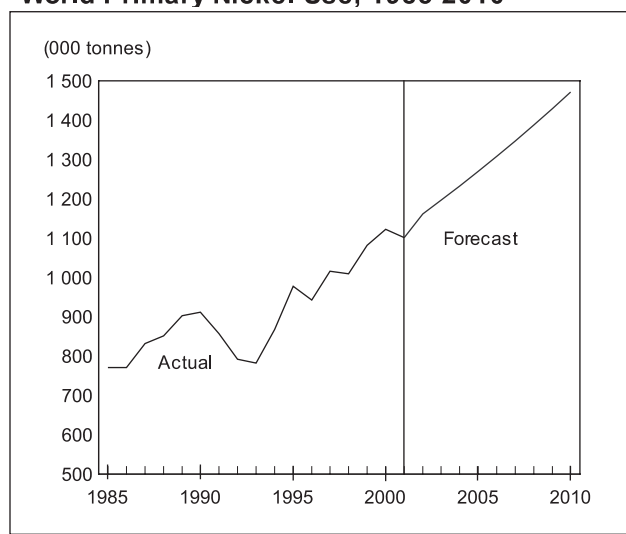
(1) January-September of year unless noted otherwise.

* Included in other data.

DEMAND OUTLOOK

The world nickel market forecast by the International Nickel Study Group (INSG) in October showed a surplus of 33 000 t for 2002 and a balanced market in 2003. The continued building of stainless capacity worldwide promises to result in increased demand, but the continued uncertainty about economic growth prospects in 2003 overshadow the promise. Medium-term world use is expected to trend at about 3%/y, but will be controlled by economic growth rates. Lower prices in the latter half of the decade are expected to increase demand as technology makes Ni production cheaper.

Figure 1
World Primary Nickel Use, 1985-2010



Source: Natural Resources Canada.
Note: This is an average forecast; yearly actuals will differ from the trend.

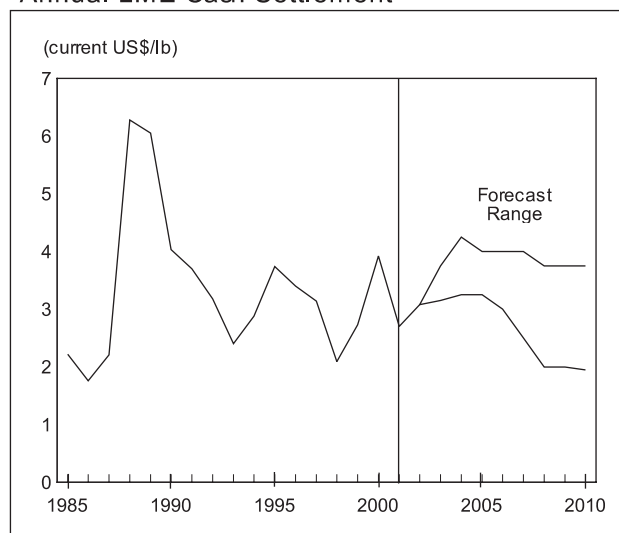
PRODUCTION OUTLOOK

Canadian production of Ni in conc. in 2002 is forecast at 182 000 t and is expected to rise back to the 2000 level of 190 000 t in 2003. Finished nickel production in Canada is forecast at 145 000 t in 2002, rising to 147 000 t in 2003. Both forecasts assume no strikes or unforeseen production interruptions. The Voisey's Bay mine is scheduled to start production in 2006 and the concentrates will be smelted at Inco's existing facilities. Consequently, some development in Sudbury and Thompson will be deferred. By 2007, Inco has forecasted production at Voisey's Bay of 50 000 t, in Ontario at 88 000 t, and in Manitoba at 34 000 t; production in 2001 was 95 000 t and 50 000 t, respectively, for the latter two. Falconbridge's forecast for its Canadian production in 2005 was 57 000 t, compared to 49 800 t in 2001.

OUTLOOK FOR PRICE (LME SETTLEMENT)

Nickel cash settlement prices peaked in 2002 on July 15 at US\$7725/t or US\$3.50/lb, up US\$2100/t from the low on January 3. On November 29, prices were US\$7390/t. The LME Ni inventory was 19 600 t at the start of the year; it increased to 29 000 t in early June and then declined to 20 000 t at the end of November. The average price for 2002 is projected at US\$6795/t (US\$3.08/lb). Prospects for higher prices for the 2003-07 period appear to be good due to large increases in stainless steel plant capacity and a protracted lack of similar capacity-building of primary nickel facilities, albeit with Norilsk's 60 000-t stockpile ready to cap prices whenever Norilsk chooses. Large late-erite projects such as Ravensthorpe, Weda Bay, Gag Island, Ramu and Nakety are presently stalled or worse. Uncertain world economic growth prospects appear to be tempered by a record of increasing Chinese demand for stainless steel. Assuming reasonably robust world economic growth, the average price for nickel in 2003 is forecast as US\$7600/t (US\$3.45/lb). In the long term, the price band between US\$2 and \$4/lb is expected to trend downwards by about late 2006 as new technology reduces production costs. In the medium term, however, if one accepts that Norilsk's collateral will stay off the market until 2005, then the period of high prices may be restricted to a period of late 2003 to 2005 because of the 60 000 t of Norilsk stock and new output from Doniambo in 2004 and from PT Antam Tbk and Goro in 2005, likely followed by Koniambo in 2007. All prices are in current dollars or dollars of the day.

Figure 2
Nickel Prices, 1985-2010
Annual LME Cash Settlement



Source: Natural Resources Canada.

Note: Information in this article was current as of November 30, 2002.

NOTE TO READERS

The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document. Many significant nickel events were not shown due to space limitations. For further information about the ownership of the metallurgical plants noted above, send an email to the author.