

NICKEL

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World economic growth faltered in 2001; the US went into recession, GDP fell in Japan and grew by only 1% in Western Europe. A more relevant yardstick than GDP for metals demand is industrial production (IP) which in 2001 fell by 8% in Japan, 4% in the US and 1% in Europe. Some of the countries of Southeast Asia fared better with China recording a 9% increase in IP and South Korea a 2% increase.

The weak global economy of 2001 resulted in a decline in world nickel demand. Western primary nickel demand fell by 4% to 980,000 t - the same percentage decrease as for stainless steel production which declined to 18 Mt. This alignment between the fall in primary nickel demand and the fall in stainless steel production is rather surprising because the consumption of nickel from other nickel-using industries, eg high-nickel alloys - which collectively make up approximately one-third of total nickel demand - fell by much more than 4% during the year. The explanation for the relatively small decline in primary nickel demand in 2001 is the abrupt decrease in the supply of stainless steel scrap, especially from Russia. Our estimate of the supply/demand balance is summarised in Table 1.

Supply/Demand Balance for Refined (or Primary) Nickel ('000 t)

	1998	1999	2000	2001
Western World Demand	940	1,000	1,025	980
Western Production	720	710	770	800
Net Eastern Exports + DLA	235	240	220	200
Western Supply	955	950	990	1,000
Market Balance	+15	-50	-35	+20
Stock level at year end	159	132	100	109
Of which: Producer	93	90	90	90
LME	66	42	10	19

Nickel Use

Stainless steel accounts for around two-thirds of nickel use - a proportion that is increasing because the growth of stainless is higher than the growth of other nickel uses. Consumption of stainless steel was expanding at an average annual rate in excess of 5% throughout the 1990s - a rate that is capable of being sustained over the long term as the intrinsic properties and value-for-money of stainless enables it to substitute for other steels and alloys. The 4% fall in stainless demand in 2001 was due mainly to the worldwide fall in IP, with the drawdown in stainless inventories, which had been a feature of the previous year, exerting only a minor influence.

Stainless Steel Production (‘000 t ingots and slabs)

	W. Europe	Japan	US	Other	Total
1997	7,000	3,950	2,150	3,300	16,400
1998	7,150	3,450	2,000	3,650	16,250
1999	7,400	3,400	2,200	4,200	17,200
2000	8,000	3,800	2,200	4,800	18,800
2001	7,600	3,850	1,850	4,700	18,000

% change

2001 vs 2000	-5	+1	-16	-2	-4
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Source: World Stainless Steel Statistics and Abacus estimates.

As in previous years, there were pronounced regional year-on-year variations in nickel consumption and it is interesting to compare the results in Table 2 (on stainless production)

with those in Table 3 (on primary nickel consumption). For example, in Europe, primary nickel consumption increased by 5% in 2001 in spite of stainless production decreasing by 5%-demand for primary nickel being supported by the 50% fall in Russian exports of stainless scrap. As most Russian scrap is used in Europe because of its geographic proximity, this support for primary nickel demand was not experienced in other regions. In the US, for example, primary nickel consumption fell by 13% mainly as a result of lower stainless production. In Japan, where, in contrast to other world regions, stainless production actually increased, consumption of primary nickel decreased by 20% because of the 40% drop in other sectors, notably nickel metal hydride (NiMH) batteries and nickel alloys.

Primary Nickel Use ('000 t)

	W. Europe	Japan	US	Other	Total
1997	360	200	155	235	950
1998	415	170	155	205	940
1999	390	185	150	275	1,000
2000	400	200	150	275	1,025
2001	420	160	130	270	980
% change					
2001vs2000	+5	-20	-13	-2	-4

Source: INSG

Mine Production

Nickel is found in sulphide and laterite ores and current production is split fairly evenly between the two ore types. Sulphides may have copper, cobalt and platinum group metals as by-products whereas laterites usually only have cobalt and, if the processing route is to ferronickel, the cobalt will not be recovered. Laterite mines are open pit but most sulphide mines are underground although some, especially in Western Australia, are open pit.

Mine Production of Nickel ('000 t)

	1998	1999	2000	2001	01/00% change
WEST	755	706	822	854	3.9
Africa	74	73	69	68	-2.0
Botswana	25	26	24	24	0
South Africa	36	36	37	36	-2.7
Zimbabwe	13	11	8	8	0
Americas	295	282	316	316	0
Brazil	32	33	36	36	0
Canada	208	186	191	194	1.6
Colombia	29	39	59	53	-10.2
Dominican Rep.	25	24	28	22	-21.4
US	0	0	0	0	na
Venezuela	0	0	2	11	na
Asia	95	102	118	129	9.3
Indonesia	74	89	98	102	4.1
Philippines	21	12	20	27	35.0
Europe	22	20	25	25	0
EU	19	17	23	23	0
Finland	2	1	3	2	-33.3
Greece	17	16	20	21	5.0
Norway	3	3	2	3	n.a.
Oceania	269	229	294	316	7.5
Australia	144	119	166	199	19.9
New Cal. (France)	125	110	127	118	-7.1
EAST	362	352	361	367	1.7
China, P.R.	48	50	51	52	2.0
Cuba	68	67	71	76	7.0
Macedonia	7	0	0	3	na
Kazakhstan	4	0	4	0	na
Serbia	1	0	0	0	na
Ukraine	0	0	0	2	na
Russian Fed.	235	235	235	235	0.0
WORLD	1,117	1,058	1,183	1,221	3.2

Source: INSG

The nickel industry is more vertically integrated than most other base metal industries so there is only a small amount of trade in ores and concentrates for custom smelting. The transport of nickel intermediate products is usually to match the different capacities of mines/smelters/refineries within a single company. For example, matte is shipped from Falconbridge and Inco in Canada to Norway (Falco) and the UK (Inco) for refining. In Asia, ore is exported from Indonesia and the Philippines to Japan where there are no nickel mines; Indonesia also exports matte to Japan. In Africa, mine production exceeds that of refineries because matte from Botswana is shipped to Norway (as well as to Zimbabwe). Australia is an importer of limonite ore for BHP Billiton's QNI refinery in Queensland, but an exporter of sulphide matte and intermediates. New Caledonia exports matte to France for refining and exports substantial quantities of ore, both saprolite to Japan for smelting into ferronickel and limonite to QNI for processing to nickel metal.

Refined Output

Production of nickel in South Africa is mainly a by-product of mining platinum group metals. Nickel production by Impala in 2001 is estimated at around 12,000 t, of which 7,000 t originated from the company's own mines, the balance being purchased from other African sources. Rustenburg produced at close to its refinery's annual capacity of 21,000 t. In Zimbabwe, refined nickel production from Rio Tinto's Empress refinery was reported as 7,000 t and, as total refined nickel production in Zimbabwe was reported at 14,000 t, the difference of 7,000 t should be the output from the Bindura refinery.

In Brazil, Cia Niquel Tocantins, part of the Votorantim group, uses the Caron ammonia leach process followed by electrowinning and produced 16,700 t in 2001, the same as the previous year. Production by Brazil's ferronickel producer, Codemin, decreased to 5,800 t from 6,300 t. The only other nickel producer in Brazil, Fortaleza, produces smelter matte (10,200 t/y) which is shipped to Finland for refining at Harjavalta by OMG.

Production of Refined Nickel ('000 t)

	1998	1999	2000	2001	01/00%
	Change				
WEST	722	712	771	808	4.8
Africa	54	53	50	51	2.0
South Africa	36	36	37	36	-2.7
Zimbabwe	17	17	14	14	0
Americas	225	200	213	233	9.4
Brazil	21	23	23	22	-4.3
Canada	147	124	134	141	5.2
Colombia	28	28	28	38	35.7
Dominican Rep.	25	24	28	22	-21.4
US	4	0	0	0	n.a.
Venezuela	0	0	0	10	n.a.
Asia	135	143	171	164	-4.1
Indonesia	8	9	10	10	0
Japan	127	134	161	154	-4.3
Europe	184	191	182	189	3.6
EU	114	117	123	120	-1.6
Austria	2	2	1	1	0.0
Finland	46	53	54	55	1.9
France	12	12	12	13	8.3
Greece	15	13	17	18	5.9
UK	39	38	38	34	-15.5
Norway	70	74	59	68	15.3
Oceania	124	125	154	172	11.7
Australia	80	79	111	126	13.5
New Cal. (France)	44	45	44	46	4.6
EAST	312	311	312	340	9.0
China, P.R.	40	45	51	49	-3.9
Cuba	39	39	40	41	2.5
Macedonia	6	0	0	3	n.a.
Russian Fed.	227	228	221	245	10.9
Serbia	1	0	0	0	0.0
Ukraine	0	0	0	2	na
WORLD	1,034	1,024	1,082	1,148	6.1

Source: INSG

In Canada, Sherritt's nickel production in 2001 was 29,200 t - a level above the refinery's nameplate capacity. Sherritt has a 50:50 joint venture with Moa in Cuba where the plant has been using a pressure acid leach process for the past 40 years to produce a nickel-cobalt sulphide intermediate product.

Inco reported that its nickel production in 2001 was 207,000 t of which 62,600 t was nickel in matte from PT Inco in Indonesia, 49,000 t was cathode from Thompson, Manitoba and 95,400 t was produced at the company's Sudbury smelter/refinery in Ontario. Approximately 34,000 t of matte were shipped from Sudbury to the company's carbonyl plant at Clydach in Wales. Inco also produces refined nickel from Canadian intermediates and purchases feed in joint ventures in Taiwan and South Korea.

Cerro Matoso in Colombia, owned by BHP Billiton, expanded its annual capacity from 30,000 t to 55,000 t by commissioning a second production line in January 2001. It produced 38,500 t of nickel in ferronickel during the year, an increase of 40% compared with 2000.

In the Dominican Republic, Falcondo produced 21,000 t of nickel in ferronickel, down from 27,800 t in 2000. This was because the plant closed in October for three months.

Production by Anglo American Corp.'s new operation in Venezuela, Loma de Niquel, was 9,700 t.

In Indonesia, PT Aneka Tambang's production was affected by a furnace breakdown and the plant produced 8,500 t nickel in the form of ferronickel. PT Inco at Soroako on the island of Sulawesi produced 62,600 t of nickel in intermediate matte, a 6% increase over the previous year. PT Inco expanded the plant's capacity from 45,000 t to 68,000 t/y, with an associated expansion of the nearby hydroelectric plant. Approximately 80% of PT Inco's output is shipped to Tokyo Nickel Co. (in which Inco is the largest shareholder) for

refining into products for use by the stainless steel industry, such as Tonimet, with the balance of 20% going to Sumitomo's electrowinning refinery at Niihama, also in Japan.

Japan's nickel production decreased by 7,000 t in 2001 to 153,700 t, of which 118,800 t were in the form of charge nickel, 32,500 t as metal and 2,400 t as nickel chemicals. Nickel production was lower than in the previous year reflecting domestic market conditions and lower ore imports from New Caledonia. There are three ferronickel producers in Japan: Pacific Metals (Pamco), Sumitomo and Nippon Yakin. In 2001, Pamco produced 35,500 t and Sumitomo 20,500 t, while Nippon Yakin produced 11,000 t for use in its own stainless steel plant. Production at Sumitomo's Niihama electrowinning nickel refinery increased to 36,000 t as a result of the increased quantity of matte supplied from the expanded PT Inco plant in Indonesia. Sumitomo has a 20% equity stake in this project with off-take rights for 20% of the production. Matte is also supplied to Japan from WMC's Kalgoorlie smelter in Western Australia.

OMG's production of nickel briquettes, cathodes and chemicals in Finland increased by 2% to 55,000 t. Most of the feed to the Harjavalta refinery and the Kokkola chemical plant is in the form of matte from Brazil and nickel sulphide concentrate/matte from Western Australia. In 2000, OMG acquired the Harjavalta nickel refinery from Outokumpu and in 2001 acquired the Cawse pressure acid leach plant in Western Australia from Centaur. The Cawse plant has a capacity of some 8-9,000 t/y of nickel, which is shipped as an intermediate product to Finland for refining.

Cathode and chemicals production by SLN at Sandouville in France was 13,000 t in 2001, an increase of 6% from the previous year.

Larco, the state-owned producer in Greece, increased production of ferronickel to 16,900 t in 2001 from 15,900 t the previous year, the increased demand for ferronickel was prompted by the reduction in supplies of Russian stainless scrap to Europe.

Falconbridge's production at Kristiansand in Norway was 68,200 t in 2001, up from the previous year's 58,700 t, although production in both years was affected by a strike at the company's mines in Sudbury. Nameplate capacity is 85,000 t/y. Falconbridge produces matte from its Sudbury smelter originating from its local mines as well as from its Raglan mine in Quebec. Nickel-copper matte is also imported into Norway from the BCL smelter in Botswana.

The ferronickel smelter at Kavadarci in Macedonia is thought to have restarted after having stopped production in 1999. Production in 2001 is estimated at 3,000 t.

In Australia, refined production last year increased from 111,000 t to 126,000 t. WMC's production of briquettes was slightly down, at 60,000 t, while BHP Billiton's QNI refinery in Queensland increased production by 8% to 28,500 t. Anaconda's Murrin Murrin refinery continued to have technical problems but increased production to 25,000 t - a level still significantly below nameplate capacity but above the 14,600 t of the previous year. Production at Bulong and Cawse is estimated at 6,000 t and 6,500 t respectively.

SLN's production of ferronickel in New Caledonia increased 5% in 2001 to 45,900 t of contained nickel.

The Russian Federation does not publish statistics on metal production but is estimated to have increased nickel production in 2001 by 10% to 245,000 t. Over 90% of Russian nickel is produced by Norilsk Nickel. In China, production of cathodes and chemicals decreased to 49,000 t from 51,000 t. Cuban production increased from 40,000 t to 41,000 t from the Nicaro and Punta Gorda plants.

A number of nickel projects are under review but because of the technical and financial problems of the three first-generation pressure acid leach (PAL) projects in Western Australia, few have progressed beyond the preliminary stage. In fact, there are only four projects that can be considered at an advanced stage. Inco

completed a bankable feasibility study on the Goro plant in New Caledonia and announced its intention to build a 55,000 t/y plant with plans to start production in 2005. It is looking for a partner for this project. Inco also announced that negotiations on the Voisey's Bay nickel project have been reopened with the Provincial Government of Newfoundland and Labrador.

Elsewhere, BHP Billiton announced its intention to complete a bankable feasibility study on the Ravensthorpe PAL project by the end of this year. Rio Tuba and Sumitomo are constructing a 10,000 t/y PAL plant in the Philippines to process the stockpiled limonite ore at Rio Tuba and then ship an intermediate product to Niihama in Japan for further processing. Sumitomo also announced that it plans to expand Niihama from 36,000 t to 60,000 t/y; its venture with Rio Tuba would provide part of that feed. If Sumitomo were to join the Goro project this would provide most of the balance for the refinery's expansion.

Prices

Table 6 shows that the Inco price differs from the LME nickel price. Inco prices show a greater stability than LME prices, reflecting the damping influence of Inco's fixed priced products on a composite of fixed and variable priced product.

Nickel Prices in US\$/lb - Average for the Period

		LME Cash	Inco realised
1997		3.14	3.36
1998		2.10	2.40
1999		2.73	2.91
2000		3.92	4.09
2001		2.70	2.93
2000	Q1	4.29	4.24
	Q2	4.27	4.53
	Q3	3.75	3.92
	Q4	3.38	3.60
2001	Q1	2.97	3.27
	Q2	3.03	3.20
	Q3	2.49	2.80
	Q4	2.28	2.48

Source: LME and Inco quarterly reports.

Table 6 shows that the LME price peaked in the first quarter of 2000 and then weakened until the fourth quarter of 2001. It was the high nickel prices of early 2000 that attracted large quantities of scrap onto the market, which in turn depressed the nickel price in late 2000 and early 2001. During the second half of 2001 it was largely the fear of a recession and the expectation of an increase in nickel inventories stemming mainly from Norilsk that caused the price to continue to decline.

However, gradually the market altered its collective stance and took the view that Norilsk was unlikely to unload inventory either to traders or onto the LME and that inventory held by other producers was not excessive. Accordingly, sentiment became positive and in early 2002 the nickel price recovered ahead of any significant increase in primary nickel consumption, with the continued restraint on exports of stainless scrap from Russia underpinning the price recovery.