



# INSG Insight

INSG SECRETARIAT BRIEFING PAPER

August 2010 – No.12

## INSG Article in Mining Journal

### “The Nickel Seesaw in 2009”

This Insight report, the twelfth in the series of INSG Insight briefing reports, provides all members with the full text of an article written by the INSG secretariat. An edited version of the article was published in the 18 June 2010 edition of *Mining Journal* under the title “*The Nickel Seesaw in 2009*”.

The Study Group has from time to time provided articles to publications in keeping with the objectives of disseminating information on nickel, improving market transparency and increasing awareness of the Study Group and its work.

#### Comments or Questions

Please contact Curtis Stewart at the INSG Secretariat. Email: [curtis\\_stewart@ilzsg.org](mailto:curtis_stewart@ilzsg.org) or telephone +351 21 359 2423

INSG  
August 2010

# **NICKEL IN 2009**

**By the International Nickel Study Group**

**Sven Tollin, Curtis Stewart and Ricardo Ferreira**

## **“The Nickel Seesaw in 2009”**

### **Introduction**

With worldwide stainless steel production at the lowest levels seen for years, the nickel industry entered 2009 facing a very weak outlook. At the beginning of the year, market prices were comparatively low and demand for nickel was slack. But in the second quarter Chinese stainless steel production started to pick up. Ferro-nickel imports into China were high even in the first quarter and remained high in the following two quarters. Large quantities of nickel metal started to be shipped into China in the second quarter and world nickel price increases followed suit. In the second half of the year stainless steel production started to increase in Europe and the US, further supporting higher nickel prices.

With supply exceeding demand, LME stocks started to increase as early as the beginning of the year and continued to build the whole year. Total LME stocks reached a level of over 158 000 tonnes at the end of the year.

During the year, nickel pig iron production responded to increasing nickel prices and demand in China. Total nickel pig iron production for 2009 is estimated at over 100 000 tonnes. As this source of material grew, it appears less Class I nickel was used in China and LME stocks therefore increased.

Disruptions to supply included the Vale-Inco strike that started in July of 2009 and which is still ongoing. The strike appears to have had less effect on the world nickel supply-demand balance last year than was initially anticipated, perhaps because the lost Canadian production has been offset by increased nickel pig iron output. However, the strike has had an impact on the market for premium grade material and nickel chemicals.

The beginning of 2010 has seen good demand for both primary and secondary nickel products and the year as a whole looks promising.

### **Economic Developments**

The global economic crisis inevitably had repercussions which were felt in the nickel industry. The IMF reported that global GDP fell one-half of one percent in 2009. However, world output is expected to recover in 2010 and rise by about 4¼ percent. The first few months of 2010 saw signs of this recovery. Major nickel consumers, such as the stainless steel industry, followed the overall pattern and saw increasing demand in the second half of 2009 and into early 2010.

### **Commodities**

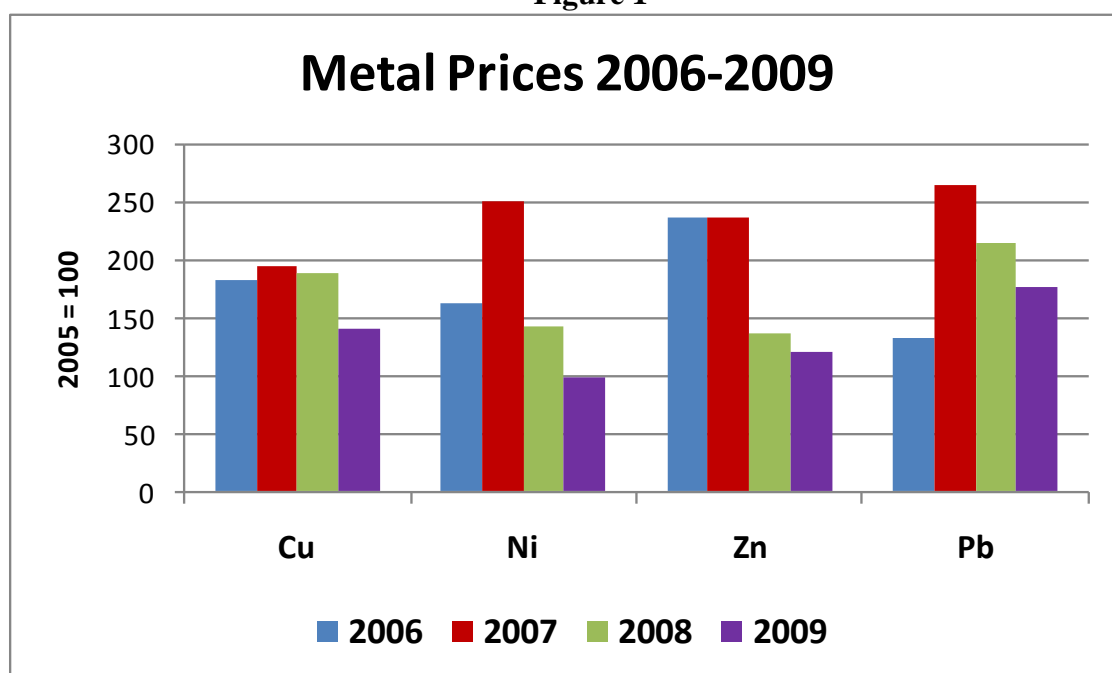
The International Monetary Fund (IMF) calculates several indices to track price changes in terms of US dollars, with 2005 as the base year. The IMF index of primary commodities

prices showed a decrease from 2008 to 2009, falling from 172.1 to 118.8 on a year-on-year basis. This was the first decline since 2001 and brought price levels back to 2006 levels.

In line with the general index, the IMF metal prices index dropped from 2008 to 2009, from 168.7 to 120.4 on a year-on-year basis. The index for nickel prices dropped to 99.3 in 2009 from 143.1 in 2008 and 251.3 in 2007. This decline brought nickel prices to below the levels seen in 2005, in terms of U.S. dollars.

Figure 1 uses IMF data to compare the changes in annualized prices over the past few years for several metals; copper, nickel, zinc and lead. In general, prices peaked in 2007 and declined in 2008 and 2009. Nickel prices had increased more rapidly than other metals and thereafter exhibited a more pronounced decline.

Figure 1



Sources: IMF, INSG

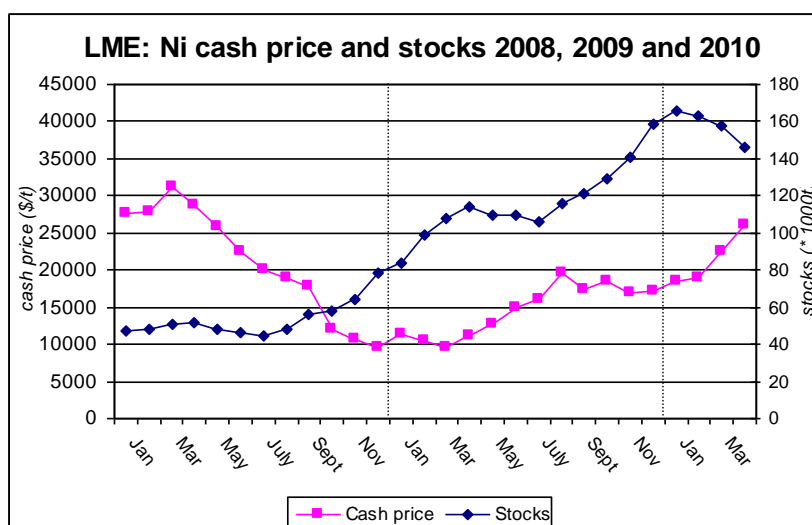
### Nickel Stocks and Prices

During the course of 2009 LME nickel stocks trended upward, continuing the pattern established in the previous year. In January 2009 LME stocks stood at 84 084 tonnes, and by the end of the year LME stocks had reached 158 424 tonnes. Stocks peaked in January 2010 at a level of 165 870 tonnes and then began to decline, reaching 145 782 tonnes in April 2010.

Atypically, prices trended upward throughout 2009 in parallel with increases in stocks. In January 2009 nickel traded at \$11 298 per tonne and at the end of the year the price had climbed to \$17 055 per tonne. In early 2010, the typical pattern reasserted itself as stock levels began to decline while prices increased.

The chart below shows the overall pattern of rising prices rising stock levels during 2009 and the fall in stocks in early 2010 accompanied by a more pronounced rise in prices.

Figure 2



Source: LME

## Mine Production

World nickel mine production in 2009 decreased by close to 12 percent compared with 2008. Most countries recorded reductions in production; however, one major exception was the Philippines where production jumped by 44 percent.

In Africa, an operation in Zambia came on-stream in 2008, but low nickel prices forced the mine to temporarily close down. Overall, total production on the continent increased by over 10 percent from a relatively small base.

In the Americas, Canada saw production dwindle as the Vale-Inco strike reduced the country's production to 137 000 tonnes, a decline of 47 percent. In total, the Americas decreased production to 318 000 tonnes, down over 32 percent from 2008. The only country with higher production was Brazil.

In Asia, a particularly noteworthy expansion in production occurred in the Philippines and smaller increases in China and Indonesia. In total, Asia produced 386 000 tonnes, an increase of 15 percent from the previous year.

In Europe, total production declined to 40 000 tonnes, a reduction of 25 percent.

In Oceania, total production decreased to 260 000 tonnes, a drop of 14 percent. In Australia production decreased to 165 000 tonnes, a decline of 18 percent, while New Caledonia's output was reduced by 6 percent to 95 000 tonnes.

It is estimated that the CIS countries reduced production to around 270 000 tonnes.

World nickel mine production is anticipated to recover in 2010 as the global economy improves. The increases are broad and cover all the geographical areas. A new producer started up in Finland last year and will ramp up production this year. If all goes to plan a new producer will start production in Papua New Guinea and the Zambian mine re-started

production in the beginning of this year. All in all world production in 2010 could increase by about 10 percent to close to 1.5 million tonnes.

Table 1

<b>Nickel Mine Production ('000 t)</b>				
	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2008/2009</b>
	<b>in %</b>			
<b>Africa</b>	<b>69.7</b>	<b>66.1</b>	<b>73.3</b>	<b>10.9</b>
Botswana	22.8	25.0	32.4	29.6
South Africa	37.9	31.7	34.6	9.1
Zambia	0.0	0.9	0.3	-66.7
Zimbabwe	9.0	8.5	6.0	-29.4
<b>America</b>	<b>534.0</b>	<b>472.4</b>	<b>318.0</b>	<b>-32.7</b>
Brazil	58.3	45.0	50.0	11.1
Canada	254.9	259.7	136.6	-47.4
Colombia	95.0	60.0	50.9	-15.2
Cuba	81.0	78.0	70.0	-10.3
Dominican Rep.	29.1	18.8	0.0	n.a.
United States	0.0	0.0	0.0	n.a.
Venezuela	15.7	10.9	10.5	-3.7
<b>Asia</b>	<b>337.7</b>	<b>336.1</b>	<b>386.1</b>	<b>14.9</b>
China, P.R.	67.5	71.5	81.1	13.4
Indonesia	188.0	180.3	185.0	2.6
Kazakhstan	1.0	1.0	0.0	n.a.
Papua New Guinea	0.0	0.0	0.0	n.a.
Philippines	79.5	83.3	120.0	44.1
Turkey	1.7	0.0	0.0	n.a.
<b>Europe</b>	<b>344.9</b>	<b>346.0</b>	<b>304.6</b>	<b>-12.0</b>
EU 27	32.5	30.4	22.2	-27.0
Finland	3.6	3.3	3.3	0.0
Greece	21.2	19.0	10.9	-42.6
Spain	7.7	8.1	8.0	-1.2
FYROM	15.0	15.1	12.0	-20.5
Norway	0.4	0.4	0.4	0.0
Serbia	1.0	7.1	5.0	-29.6
Russian Fed.	290.0	285.0	265.0	-7.0
Ukraine	6.0	8.0	0.0	n.a.
<b>Oceania</b>	<b>300.0</b>	<b>302.5</b>	<b>260.0</b>	<b>-14.0</b>
Australia	174.7	201.1	165.0	-18.0
New Cal. (France)	125.3	101.4	95.0	-6.3
<b>WORLD</b>	<b>1586.3</b>	<b>1523.1</b>	<b>1342.0</b>	<b>-11.9</b>

Source: INSG

## Refined Nickel Production

Total refined nickel production decreased to 1.33 million tonnes in 2009, down 3.5 percent compared with 2008.

In Africa, production for 2009 declined by 13 percent to around 36 000 tonnes.

The Americas experienced a substantial reduction of close to 22 percent in overall production with total production reaching 238 000 tonnes. Canada had the largest decline of 30 percent, mainly due to the Vale-Inco strike, but all other countries saw declines in production as well. The FeNi plant in the Dominican Republic was closed for the whole year and remains closed.

Asian production increased by 14 percent and reached 433 000 tonnes. China P.R. achieved a 27 percent increase to 255 000 tonnes. Chinese nickel pig iron production had a good year and increased to between 100 000 and 110 000t during the year, up from around 70 000 t the previous year, contributing a large part of the total Chinese nickel production. Japan remained the second largest producing country, with production of 144 000 tonnes, down 8 percent. In the Republic of Korea FeNi production was ramped up and production reached 12 000 tonnes, up from 2 000 tonnes in the year before.

Europe encountered a decline in production to 185 000 tonnes, a decrease of over 20 percent. All countries experienced a reduction.

CIS countries recorded a decline to about 270 000 tonnes, a decrease of roughly 3 percent.

Oceania's total production increased by close to 16 percent to 169 000 tonnes. Australian production was 131 000 tonnes, up 20 percent. New Caledonia also experienced an increase in output, by 2 percent to 38 000 tonnes.

World production is anticipated to increase in 2010 to 1.4 million tonnes, up nearly 5 percent on the previous year. It is anticipated that all producing countries will see improved production levels.

**Table 2**  
**Refined Nickel Production ('000 t)**

	2007	2008	2009	2008/2009 in %
<b>Africa</b>	<b>49.1</b>	<b>42.0</b>	<b>36.4</b>	<b>-13.3</b>
South Africa	34.4	30.0	31.4	4.7
Zimbabwe	14.7	12.0	5.0	-58.3
<b>America</b>	<b>332.2</b>	<b>305.2</b>	<b>238.4</b>	<b>-21.9</b>
Brazil	31.5	30.2	28.1	-7.0
Canada	162.6	167.7	116.9	-30.3
Colombia	52.3	41.6	50.9	22.4
Cuba	41.0	36.0	32.0	-11.1
Dominican Rep.	29.1	18.8	0.0	n.a.
United States	0.0	0.0	0.0	n.a.
Venezuela	15.7	10.9	10.5	-3.7
<b>Asia</b>	<b>382.7</b>	<b>377.2</b>	<b>433.0</b>	<b>14.8</b>
China, P.R.	205.0	200.0	255.0	27.5
Indonesia	16.4	17.6	12.0	-31.8
Japan	161.3	157.6	144.4	-8.4
Korea, Rep.	0.0	2.0	21.6	* *

<b>Europe</b>	<b>508.0</b>	<b>511.0</b>	<b>454.5</b>	<b>-11.1</b>
EU 27	121.5	122.6	80.5	-34.3
Austria	0.5	0.5	0.5	0.0
Finland	55.0	51.0	40.0	-21.6
France	13.2	13.4	13.9	3.7
Greece	18.7	16.7	8.3	-50.3
United Kingdom	34.1	41.0	17.8	-56.6
FYROM	15.0	15.1	12.0	-20.5
Norway	87.6	88.7	88.6	-0.1
Russian Fed.	266.3	258.7	255.5	-1.2
Serbia	1.0	7.1	5.0	-29.6
Ukraine	16.6	18.8	12.9	-31.4
<b>Oceania</b>	<b>165.7</b>	<b>146.5</b>	<b>169.5</b>	<b>15.7</b>
Australia	117.0	108.9	131.3	20.6
New Cal. (France)	48.7	37.6	38.2	1.6
<b>WORLD</b>	<b>1437.7</b>	<b>1381.9</b>	<b>1331.8</b>	<b>-3.6</b>

Source: INSG

## Primary Nickel Usage

Primary nickel usage decreased by close to 6 percent worldwide in 2009 to 1.21 million tonnes, from 1.29 Mt in 2008. This is the third year in succession of declining usage. There were declines in the Americas, Europe and Oceania, but increases in Africa and Asia. The real usage was very weak in the beginning of the year as stainless steel production was running at very low capacity utilization. Asia started to increase usage in the second quarter and the rest of the world in the third quarter.

Production of stainless steel is the main driver for nickel demand, accounting for about 65 percent of the annual volume of primary nickel usage. After the large increase in 2006 of close to 17 percent, production declined in 2007 by 2 percent to 27.8 million tonnes and further to 24.6 Mt in 2009, a decline of 5 percent. In contrast to the global trend, Chinese stainless steel production in 2009 managed another record. The country's stainless steel production continued at a record breaking level in the first quarter of 2010.

Most stainless steel users remained cautious and only increased stocks to match new demand levels and also to avoid any downward price surprises.

The proportion of CrNi-austenitic grades in total production was 59.9 percent during 2009, up from 57.2 percent 2008. The production share of CrMn-austenitic grades was 12.3 percent in 2009, basically the same as in 2008, and ferritic grades fared slightly better as they increased marginally to 28.4 percent in 2009. As a result, the nickel intensity of stainless steel increased during the year. This improvement applied for both primary and secondary materials.

**Table 3**  
**Stainless Steel Production ('000 t)**

	2008	2009	2008/2009
		preliminary	in %
<b>W. Europe / Africa</b>	8272	6449	-22.0
<b>Central + Eastern Europe</b>	333	237	-28.8
<b>The Americas</b>	2315	1958	-15.4
<b>Asia w/o China</b>	8068	7130	-11.6
<b>China</b>	6943	8805	26.8
<b>WORLD</b>	<b>25930</b>	<b>24578</b>	<b>-5.2</b>

Source: ISSF

Those regional trends in world stainless steel production are reflected in the primary nickel consumption patterns during the same period, as outlined in Table 4.

**Table 4**  
**Primary Nickel Use ('000 t)**

	2007	2008	2009	2008/2009
				in %
<b>Africa</b>	33.6	28.5	32.0	12.3
<b>America</b>	148.2	162.8	118.8	-27.0
<b>Asia</b>	702.8	689.8	764.4	10.8
<b>Europe</b>	422.3	403.3	294.2	-27.1
EU 27	387.0	369.6	264.9	-28.3
<b>Oceania</b>	3.0	2.9	2.6	-10.3
<b>WORLD</b>	<b>1309.9</b>	<b>1287.3</b>	<b>1212.0</b>	<b>-5.8</b>

Source: INSG

## Projects and Expansions

The list of new nickel projects and expansions had thinned out by the end of 2008. With low nickel prices the interest in investments in new facilities was at a nadir and the possibility to raise capital was also limited.

The mega projects were also affected. The Ravensthorpe and Yabulu operations were sold to new owners, while the Goro project again encountered difficulties and has yet to get started in May 2010. Also in New Caledonia, the Koniambo project has been delayed.

In Africa, the Zambian Munali project, which is a sulphide ore body, started production in April 2008, had to close down in early 2009, and is now reported to be producing again in early 2010 as capital has been raised and nickel prices have improved. A new project with an annual capacity of 60 000 tonnes, the Ambatovy project in Madagascar, is to be completed this year and the first metal is anticipated to be produced in the first quarter of 2011.

In Brazil projects also have been delayed including Barro Alto and Onça Puma, backed by major mining companies. They will now come into production only in late 2010, at best.



Some projects have been able to move forward. The Talvivaara nickel mine and leaching project in Finland went into production with the first product for shipment in February 2009, but ramp up of production has been very slow. Santa Rita in Brazil is the only sizable new mine which came into production in 2009. Further, in the Philippines, Coral Bay Nickel successfully doubled their production capacity to 20 000 tonnes per year. Other projects in the Philippines could be taken into production with short lead times if demand and prices are sufficiently attractive.

In China there were several new nickel pig iron facilities being built in 2009, some using the blast furnace route, but mainly using electric arc furnaces. While it is difficult to set a precise time frame when these facilities will come on stream, the nickel price will play a major role. Several other new nickel pig iron facilities have been reported as commencing operations in 2009 and early 2010. Indonesia, which has attractive ores to sell, could become a larger supplier to the Chinese nickel pig iron industry in 2010

## **Innovations**

Innovation in nickel production is driven by the need to lower costs as well as the need to extract nickel from lower grade ores, such as laterite ores. Two innovations currently attracting attention are heap leaching and nickel pig iron production.

The heap leaching process typically involves sizing the ore (where necessary), and contacting the ore with leaching reagents (such as sulphuric acid) prior and during agglomeration. The agglomerates are stacked in a heap and then leached with acid over a period of 6 to 12 months.

Heap leaching offers the promise of expanded opportunities for the profitable exploitation of nickel laterite resources. Whether that promise can be realized depends on a number of factors. Heap leaching technology is relatively new and is still evolving. Each mine site offers specific unique challenges in the application of the process. In addition the technology is tightly held and any new project development is required to go through a considerable learning curve.

Heap leaching is likely to gain increasing acceptance with the nickel operators, junior companies and investors. However the adoption of heap leaching will depend not only on technical factors, but also on the overall nickel market, investor confidence, government regulations and the success or otherwise of the pioneer commercial heap leaching operations.

### **Heap Leaching Project Status**

Table below provides a summary of the heap leaching projects which have advanced to demonstration plant status and where public domain information is available.

**Table 5  
Heap leaching projects**

<b>Project</b>	<b>Country</b>	<b>Owner</b>	<b>Status</b>
Yuanjiang	China	Yunnan Tin Group	Demonstration plant operational since 2005, shut down in Oct 2008 and restarted in May 2009, with an expected production of 1,400 tpa Ni <sup>1</sup> .
Çaldağ	Turkey	European Nickel	Demonstration plant operational since 2004, awaiting finance for commercial plant which is expected in 2010.
Acoje	Philippines	European Nickel	Demonstration plant constructed in 2009, with commissioning due in early 2010. Bankable feasibility study underway.
Murrin Murrin	Australia	Minara Resources	Demonstration plant operational since 2007, producing 2,000 tpa Ni. Commercial plant deferred due to nickel market.
Níquel do Piauí	Brazil	Vale	Demonstration plant constructed in 2006, front-end engineering studies completed by Minproc, further studies planned.
Hellas	Greece	NTUA	Small demonstration plant of 800 tonnes ore operated on Larco's mine site, testwork appears to have been completed <sup>2</sup> .
Cerro Matoso	Columbia	BHPB	Demonstration plant trials progressing, conceptual engineering study completed <sup>3</sup> .
Jump-up Dam	Australia	Heron Resources	Partially built demonstration plant was sold off in 2008, following sub-economic outcome of feasibility study <sup>4</sup> .

### **Nickel Pig Iron**

Production of nickel pig iron is increasing rapidly in China and can be seen as an innovative response to the challenges facing the nickel market. The development of nickel pig iron occurred in response to the particular set of conditions in China, where blast

<sup>1</sup> Sino-Platinum Metals press release on 20 May 2009, refer to <http://chinamining.org/>

<sup>2</sup> NTUA's heap leaching results shown on [www.hydrometallurgy.metal.ntua.gr](http://www.hydrometallurgy.metal.ntua.gr)

<sup>3</sup> Refer to [www.mining-technology.com/projects/cerro-matoso](http://www.mining-technology.com/projects/cerro-matoso)

<sup>4</sup> ASX Press Release, Heron Resources, 25 January 2008

furnace capacity was available to utilize feedstock containing nickel. As the market has evolved, more modern electric furnaces have started to produce nickel pig iron.

The nickel pig iron production in China is currently based on small scale blast furnaces (57%) and electric furnaces (43%). The volumes of blast furnaces are typically 100 to 500 m<sup>3</sup> and the power for the electric furnaces is typically 5 to 20 MW.

Where new approaches such as leaching and production of nickel pig iron are implemented they are likely to hold down capital costs per tonne of annual product capacity. This in turn could help to stabilize production and possibly reduce price volatility.

## **Conclusion**

Starting from a low point, 2009 was a year of slow recovery for nickel. The Chinese used the opportunity to restock nickel at advantageous prices in the first half of the year. Nickel prices slowly improved over the year as stainless steel production increased, first in Asia and later in Europe and the USA.

One of the major events was the beginning of the Vale-Inco strike in Canada, which started in July 2009 and is still continuing in late May 2010. This changed the nickel fundamentals and as time moved on supply of premium grades decreased and nickel premiums inched up month by month, and supply has been tight in the US market for some time now.

More or less at the same time Chinese nickel pig iron production started to increase and supply the Chinese stainless steel industry with more nickel and iron units.

Overall, the market ended up well supplied with nickel units, but short of high quality material. As a measure of the situation, LME stocks were very high at the end of the year.

The beginning of 2010 saw continued high stainless steel production and demand for both primary and secondary nickel products. Nickel prices rapidly increased in the first months of 2010, but have retracted somewhat since the middle of May. While the outlook is for economic recovery in the course of 2010, the recent economic crisis centered on Greece is a reminder that the recovery is still subject to disruptions.