

## COBALT

*By Michael Hawkins*

**W**orld refined cobalt demand in 2003 is estimated at about 42,000 t, 8% higher than in 2002. The increase in demand resulted mainly from a massive increase in demand in all end-use sectors in China, and in the rechargeable battery sector in Japan, particularly in the second half of the year.

Refined cobalt production from Cobalt Development Institute (CDI) members totalled 26,351 t. Overall, worldwide availability was 44,495 t. This is 3,542 t (8.6%) higher than in 2002.

The year commenced with the cobalt price at its lowest level for over 15 years (between US\$6.30/lb and US\$7.25/lb). Prices increased slowly over the next six months to between US\$8.50/lb and US\$11.0/lb at the beginning of June. Thereafter, they remained relatively stable until early October when they began rising rapidly. At the end of the year, prices were between US\$20.00/lb and US\$23.00/lb and still rising.

### **Production**

Table 1 illustrates refined cobalt production from CDI members for the calendar years 1997-2003. The table shows that total production from members in 2003 was 26,351 t, assuming an estimate for Chambishi Metals as the company's actual figure was not available at the time of writing. As Gécamines is no longer a member of the Institute its production figures are not included in this table. Hence, excluding Gécamines, production from CDI members increased by 641 t in 2003.

Large increases in production were noted by Falconbridge and Umicore. The high increase in production by Umicore occurred in the second half of the year as a result of its response to the massive increase in the price of refined cobalt in the final few months of the year. Umicore has announced that it intends to increase its refined production even further in 2004 and 2005. Chambishi Metals increased production compared with 2002, but it was still operating at less than full capacity. These increases were offset by reductions from a number of other producers.

Production by OMG was slightly down on 2002, reflecting its announcement at the end of 2002 that it would reduce production by 20%. Production by Inco was significantly down, at least partially, as a result of the strike at its Sudbury operations from June to August 2003. Production from CTT was also slightly down. The low cobalt prices throughout 2002 and the first eight months of 2003 caused CTT major problems and in order to increase value added and maintain a stable cash flow, the firm began producing high-quality cobalt oxide suitable for the rechargeable battery market towards the end of the year. (Table 1)

Refined cobalt availability from other sources is shown in Table 2. As in 2002, the table includes actual production figures from Russia. The total production from non-CDI members was 16,156 t, 2,197 t (15.8%) higher than in 2002. This increase was almost entirely due to a massive increase in Chinese production. Less dramatic increases were also noted from Tocantins (Brazil), Mopani Copper (Zambia) and Murrin Murrin (Australia). The total of 2,039 t produced at Murrin Murrin is an improvement on 2002 but still only amounts to about 70% of production capacity. Gécamines 2003 production, stated as 1,200 t in a recent press release, is its lowest ever recorded and reflects the difficulties experienced in the Democratic Republic of Congo (DRC) in recent years.

When US Defense Logistics Agency (DLA) deliveries from its stockpile are included, the total cobalt availability from other sources was 18,143 t, an increase of 2,900 t (29.1%) on 2002, and in spite of no production being forthcoming from Bulong (Australia) and Kasese Cobalt Co (Uganda). (Table 2)

Deliveries from the DLA during the year were 703 t higher than in 2002. Sales by the DLA totalled 2,907 t, an increase of 1,426 t on 2002, which means that stocks of cobalt sold but still in DLA warehouses at year-end totalled about 1,798 t. DLA stocks of unsold metal will be exhausted by 2005 if the DLA continues to sell at its approved rate of 2,700 t per fiscal year.

Total availability of refined cobalt from 1997 to 2003 is shown in Table 3. These data show that overall availability in 2003 was up by 3,541 t (8.6%) compared with 2002. As in the past, these figures do not include production of refined cobalt from those companies treating various cobalt-containing intermediate products and scrap (and who do not report their numbers).

### **Demand**

Latest data indicate that apparent refined cobalt demand in 2003 was about 8% up on 2002, at some 42,000 t. The large increase results, in the main, from extensive growth in demand in Asia. Initial figures from the US Geological Survey indicate that US demand was about 3% higher than in 2002. Small increases were noted in the chemicals, hard-metals and magnet sectors. Cobalt demand in Europe is estimated to have fallen slightly compared with 2002. The reduction appears to be across all end-use sectors.

By far the greatest increase in apparent demand was seen in Asia where a massive increase of about 50% was noted in Japan and an even larger increase of about 80% in China. These increases mainly reflect the increase in growth in the rechargeable-battery sector. Having said this, the massive expansion in the Chinese economy meant that increases in cobalt demand were observed in all end-use sectors. In spite of the growth in Asian economies, the large increases noted suggest that some of this demand was actually restocking on the part of consumers, especially as much of the increase was noted in the first half of the year when prices were rising slowly but were still relatively low.

### **Health, safety and environment**

By far the most significant event during 2003 was the agreement on October 29 of the New Chemicals Policy (NCP) by the EU Commission. This agreement allowed European Parliament and Council negotiations to begin with a view to implementation of the NCP by 2006. The implications of this policy still appear to be vastly underestimated by most of the cobalt industry, but without doubt its implementation will have a large effect on the industry.

To re-iterate, the new system for assessing both existing and new chemicals requires that all chemicals manufactured in, or imported into, the EU in amounts over 1 t/y, must be registered with the authorities. Those produced or imported in volumes of over 100 t/y (or chemicals of concern at lower tonnages) must be evaluated by the authorities before they are allowed into the EU. Chemicals of high concern, which are carcinogenic, mutagenic, toxic to reproduction (CMRs), persistent, etc, will be authorised for use only if the safety of their application is guaranteed by industry. Deadlines are set for implementation of the policy, based on annual production/import volumes.

In order to assist industry in meeting the challenges of this new policy, the CDI has designed and implemented a long-term strategic research programme to address human health and environmental risk.

At its meeting in November 2003, the European Chemicals Bureau (ECB) Working Group on the Classification of CMR (cancer, mutagenicity and reproductive toxicity) Substances considered imposing hazard classifications for various cobalt compounds. The proposals were:

- to place water-soluble cobalt (II) salts in category 2 for fertility effects and in category 3 for mutagenicity; and
- to place elemental cobalt, cobalt oxides (II) and cobalt sulphate (II) in category 3 for carcinogens.

The CDI represented the cobalt industry at the meeting. This resulted firstly in an agreement to postpone a decision on the first proposal until the next meeting in May 2004, when the Institute will provide more information, and secondly to postpone a decision on the second proposal until new data is available.

### **Price**

Figure 1 illustrates the change in the average quarterly *Metal Bulletin* free-market price quotation for cobalt since 1989 for 99.8% and 99.3% minimum cobalt. Based on quarterly averages the graph does not show short-term price fluctuations. This is evident in that the averages for the final quarter of 2003 do not reflect the peak prices reached at the end of the year of US\$23.00/lb and US\$21.00/lb for high- and low-grade metal respectively. (Graph at end of tables section)

At the end of 2002, the price of refined cobalt stood at about US\$6.70/lb and US\$6.20/lb for high- and low-grade metal respectively. Prices then rose slowly as producers became more disciplined in the market, and reached

averages of US\$10.45/lb and US\$9.50/lb for high- and low-grade metal respectively in July. Thereafter they remained relatively flat until October when they began to rise rapidly as a result of the increase in demand, particularly in China.

The realisation that very little additional cobalt was available to the market, at a time when demand was rising rapidly, caused the sharp rise in price. At the end of the year prices had reached an average of US\$22.00/lb and US\$20.50/lb for high- and low-grade metal respectively.

At the same time as prices were rising throughout the year, the differential between high- and low-grade metal widened. This was attributed to fears within the industry of a shortage of high-grade metal as a result of the announcement of a strike at Inco's Sudbury operations and production difficulties on the part of two other producers. These factors resulted in a shortage of low nickel content material which is essential to the rechargeable-battery sector.

### **National stockpiles**

The Defense Logistics Agency (DLA) continued to sell cobalt from the US National Stockpile. During the calendar year it sold 2,907 t and delivered 1,987 t. Since the DLA commenced selling from the stockpile in 1993, sales and deliveries totalling 21,052 t and 19,254 t respectively have been made. This means that a total of 1,798 t of sold metal was still in DLA warehouses at the end of 2003.

No sales from other national stockpiles were recorded during 2003 although as in previous years some material coming out of the CIS could have originated from the Russian stockpile.

### **Outlook**

The outlook for cobalt at the beginning of 2004 was one of tightness in supply as a result of market discipline on the part of existing producers and increasing demand. Since no additional cobalt can be expected in the market from new producers until at least 2007, the only source of additional metal will be from existing producers. Furthermore, if the DLA continues to sell cobalt at its normal approved rate of 2,700 t/y the US Stockpile will be depleted in 2005. These factors resulted in the price of cobalt rising in January 2004 to between US\$24.50/lb and US\$28.00/lb and stabilising at this level where it remained at the end of March.

The high price of cobalt at the end of 2003 resulted in Kasere Cobalt Co re-opening its operations in Uganda in January 2004. Also, OMG, Chambishi Metals and the Murrin Murrin operation in Australia have the possibility of increasing their production in 2004. It is estimated that additional metal from these four producers could total 6,000 t/y.

In response to the massive increase in demand in China in 2003, Jinchuan announced plans to increase its cobalt production to over 4,000 t/y in the next

few years. However, this increase will depend on receiving sufficient feed materials.

Announcements that America Mineral Fields (now renamed Adastra Minerals) will proceed with its Kolwezi Tailings project in the DRC and BHP Billiton with its Ravensthorpe project in Australia will have no impact on the market until about 2007. Furthermore, the announcement that Gécamines plan to rejuvenate its operations in the DRC is unlikely to influence the market in the short term.

Since cobalt is used in relatively specialised applications and cannot be easily substituted, demand could increase further during the year. The perception, therefore, is still one of tightness in supply. However, as already alluded to, significant stocks of cobalt could still exist in various parts of the world, particularly Asia.

**Table 1 CDI Members Production Statistics (t)**

	1998	1999	2000	2001	2002	2003
CTT	241	470	1,200	1,200	1,100	1,100
Falconbridge	3,851	4,009	3,433	3,314	3,993	4,556
ICCI	2,640	2,770	2,855	2,943	3,065	3,141
Inco	1,740	1,420	1,470	1,450	1,480	1,000
OMG	5,250	6,200	7,700	8,100	8,200	7,990
QNI	1,395	1,539	1,520	1,818	1,863	1,800
Sumitomo	329	221	311	350	354	379
Zambia	5,011	3,946	2,316*	2,789*	4,344*	4,500**
Eramet	172	180	204	199	176	181
Umicore	1,200	950	1,110	1,090	1,135	1,704
<b>Total</b>	<b>21,829</b>	<b>21,705</b>	<b>22,119</b>	<b>23,253</b>	<b>25,710</b>	<b>26,351</b>

+ Estimate.

• Chambishi Metals only.

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**Table 2 Other Refined Cobalt Production/Availability (t)**

	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
Brazil	364	630	792	889	960	1,097
Bulong		79	192	203	200*	-
China	1,200	1,200	1,200	1,470	1842	4,576*
Gécamines	4,490	5,180	4,320	3,199	2,149	1,200*
India	120	120	206	250	270	255
Mopani Copper			1,026	1,876	1800	2,050
RSA	320	320	320	252	250*	285
Russia	3,700	4,000	4,100	4,600	4,200	4,654
Kasese		77	420	634	450*	-
Murrin Murrin		83	925	1,452	1,838	2,039
<b>TOTAL</b>	<b>10,194</b>	<b>11,689</b>	<b>13,501</b>	<b>14,825</b>	<b>13,959</b>	<b>16,156</b>
DLA Deliveries	2,310	1,679	3,083	1,893	1,284	1,987
<b>TOTAL</b>	<b>12,504</b>	<b>13,368</b>	<b>16,584</b>	<b>16,718</b>	<b>15,243</b>	<b>18,143</b>
DLA Sales	1,948	2,234	3,078	1,770	1,481	2,907
DLA Sales (cumulative)	9,582	11,816	14,894	16,664	18,145	21,052
DLA deliveries (cumulative)	9,328	11,007	14,090	15,983	1,726	19,254

\*Estimates.

- Chinese production excludes that produced by Umicore in China which is included in the Umicore figure in Table 1.

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**Table 3 Total Refined Cobalt Availability (t)**

	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
CDI Members	21,829	21,705	22,119	23,253	25,710	26,351
Others	12,504	13,368	16,584	16,718	15,243	18,143
<b>Total</b>	<b>34,333</b>	<b>35,073</b>	<b>38,703</b>	<b>39,971</b>	<b>40,953</b>	<b>44,495</b>