

# COBALT

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World cobalt demand in 2000 was about the same as that in 1999. Demand rose slightly in the first half of the year, but a slow down in the economies of the industrialised countries resulted in a softening of demand in the December quarter of the year.

After adjusting refined production figures for 1999 to include those from the Central Mining Group (CMG) in the Democratic Republic of Congo (DRC), which were not available until recently, refined cobalt availability reported by the Cobalt Development Institute (CDI) in 2000 increased by about 16.45%, compared with 1999.

In the first half of the year there appeared to be stability between cobalt supply and demand and prices remained relatively steady, purely reflecting short-term supply and demand imbalances. Following Falconbridge's declaration of *force majeure* on cobalt deliveries in early October, the price

of high-grade cobalt rose temporarily but soon drifted downwards as consumers realised there was no shortage of high-grade metal.

At the end of the year the price for high and low grade metal was US\$11.25/lb and US\$10.70/lb respectively, approximately US\$3.00/lb below those prices quoted at the end of 1999.

## Production

The following table illustrates refined cobalt production as reported by the Cobalt Development Institute members for the calendar years 1994-2000 using methodology adopted in 1999, which the Institute believes, eliminates double counting. Production from Gécamines for 1999 has been corrected to include that from the Central Mining Group, which was not available at the time of publication of the 1999 review. As in the past, Centaur Mining's production from Cawse has not been included as this is upgraded by

CDI Members Production Statistics (t)							
	1994	1995	1996	1997	1998	1999	2000
CTT			80	220	241	470	1,200
Falconbridge	2,923	2,804	3,099	3,417	3,851	4,009	3,433
Gecamines	2,439	3,422	3,540	2,808	4,490	5,180 <sup>#</sup>	4,320
ICCI	1,820	1,730	2,070	2,250	2,640	2,770	2,855
Inco	1,130	1,362	1,544	1,500	1,740	1,420	1,470
OMG	3,000	3,610	4,160	5,000	5,250	6,200	7,700
QNI				617	1,395	1,539	1,520
Sumitomo	161	222	228	263	329	221	311
Zambia	2,639	2,934	4,799	3,949	5,011	3,946	2,316*
Eramet	141	161	174	159	172	180	204
Union Minière	1,000	1,000	1,200	1,200	1,200	950	1,110
Kasese						77	420
Murrin Murrin						83	925
<b>Total</b>	<b>15,253</b>	<b>17,445</b>	<b>20,894</b>	<b>21,383</b>	<b>26,319</b>	<b>27,045</b>	<b>27,784</b>

\* Chambishi Metals Only

# Includes correction for Gécamines

other refineries and included in their figures.

The table shows that production from CDI members increased by 739 t in 2000. However, Zambian production quoted in 2000 in this table is only that produced by Chambishi Metals as Mopani Copper is not a member of the Institute.

Production from individual companies varied considerably as compared with that of 1999. A decrease of 576 t was noted from Falconbridge, which undoubtedly resulted from the strike at Sudbury in the latter part of the year. A decrease of 860 t from Gécamines in the DRC was also recorded and probably resulted from the termination of the Central Mining Group activities in the DRC at the end of March 2000. The decrease from Zambia of 1,630 t results from the figure for 2000 only including Chambishi Metals' production. Mopani Metals' production, given in Table 2, must be added to obtain total Zambian production.

Throughout the year, Chambishi Metals experienced difficulties in receiving concentrates from Roan Antelope Mining Corp. of Zambia (RAMC) as a result of the company's ongoing financial difficulties which

finally resulted in it being placed into liquidation in November 2000. From time to time, Chambishi Metals imported small amounts of cobalt containing concentrates from the DRC to partially offset shortages from within Zambia. The company also commissioned its slag treating facility in October 2000. This expansion will increase its cobalt production capacity by about 4,000 t to a total of 6,500 t/y.

Significant increases in production were seen from OMG (US/Finland), Murrin Murrin (Australia), CTT (Morocco) and Kasese (Uganda). The commissioning of the Big Hill smelter in the DRC to treat cobalt-containing slag will assist OMG in increasing production towards its target of 10,000 t/y in the next few years. The increases reported by Murrin Murrin and Kasese indicate that these new projects are beginning to overcome their start-up difficulties. Further increases from these two projects are foreseen in 2001 as they continue ramping up to their production capacity of 3,500 t/y and 1,000 t/y respectively.

The increase of 730 t from CTT is in line with its planned expansion. This increase means that Moroccan concentrates are no longer

<b>Other Cobalt Production/DLA (t)</b>							
	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
RSA	246	190	292	294	320	320	320*
Brazil	165	166	193	266	364	630	792
India				110*	120*	120*	206
China	800	1,076	1,200	1,200	1,200	1,200	1,200
DLA Deliveries	1,502	1,554	2,052	1,621	2,310	1,679	3,082.6
Other Stockpiles		270	500				
Mopani Copper							1,026 <sup>#</sup>
CIS Exports	2,070	2,787	1,654	3,200	2,800	2,678	4,700
Bulong						79	192
<b>Total</b>	<b>4,783</b>	<b>6,043</b>	<b>5,891</b>	<b>6,691</b>	<b>7,114</b>	<b>6,706</b>	<b>11,518.6</b>
DLA Sales	1,717	2,735	1,020	1,684	1,948	2,234	3,078
DLA Sales Cumulative	2,195	4,930	5,959	7,634	9,582	11,816	14,894
DLA Deliveries Cumulative	1,791	3,345	5,397	7,018	9,328	11,007	14,089.6

\* Estimate

# includes estimate for March quarter production

being shipped to China for processing and this could result in Chinese production declining in the future unless Chinese refineries can secure alternative sources of feed material. Production by ICCI, Inco, QNI, Sumitomo and Union Minière was similar to 1999.

Cobalt production from other producers and deliveries from the Defense Logistics Agency (DLA) and other stockpiles are shown in Table 2. It is interesting to note that whereas sales from the DLA increased by 843 t in 2000, deliveries increased by 1,404 t to 3,083 t roughly in line with total sales concluded during the year. This means that at the end of the year, about 804 t of material sold by the DLA remained in its warehouses, ie a decrease of 4 t, compared with the end of 1999.

Minor increases in production of 162 t and 113 t were noted from Tocantins (Brazil) and Bulong (Australia) respectively. Production from Mopani Copper, (Zambia), includes an estimate for ZCCM's production from the Nkana Refinery for the March quarter of 2000 prior to ZCCM's privatisation. Combining production from Chambishi Metals and Mopani Copper, Zambian cobalt production totals 3,342 t, a decrease of 604 t (15%) from that of 1999.

Official reports and import/export statistics indicate that CIS exports rose in 2000 by 2,022 t to 4,700 t. However, this total has been questioned by a number of experts in the cobalt industry who believe it includes cobalt-containing materials processed by other refineries and already included in their refined production figures. They believe a more accurate figure for Russian refined cobalt production is 3,200 t, ie an increase of 533 t or 19.5% over 1999.

Although no longer receiving Moroccan

concentrates, import/export statistics indicate that Chinese production remained at about 1,200 t, the same as in 1999.

Taking all factors, into consideration, refined cobalt availability from non-CDI members totalled 11,519 t in 2000, an increase of 4,813 t or nearly 72% over 1999.

The total refined cobalt availability from 1994-2000 is shown in table 3. Overall availability in 2000 increased by 5,551 t or nearly 16.5% over that of 1999

These statistics do not include production of refined cobalt from companies, that treat various cobalt-containing intermediate products and scrap, and do not report their output.

**Demand**

During 2000, a major fundamental change in marketing cobalt occurred. In 1999, WMC began selling cobalt via its web site and in September 2000, it was joined by OMG which began selling its cobalt briquettes in this manner. In addition to these producers, a number of trading companies began to offer a buying and selling service via the Internet. It is too early to measure the impact of this marketing method.

Published data suggests that world wide cobalt demand in 2000 (excluding Russian demand which is assumed to be met from domestic sources) was similar to that in 1999. Overall, demand in the first half of the year was marginally up compared with the same period in 1999 as a result of the continuing strength of the superalloy and rechargeable battery sectors. The traditional slow down in

Total Cobalt Availability (t)							
	1994	1995	1996	1997	1998	1999	2000
CDI Members	15,253	17,445	20,894	21,383	26,319	27,045	27,784
Others	4,783	6,043	5,891	6,691	7,114	6,706	11,519
	<b>20,036</b>	<b>23,488</b>	<b>26,785</b>	<b>28,074</b>	<b>33,433</b>	<b>33,751</b>	<b>39,303</b>

business in July and August was followed by a slow down in the US economy and reduced profit forecasts by the electronic industry. These factors resulted in a decline in cobalt demand in the latter half of the year, which partially offset the increases seen in the first half.

The overall increase in demand noted in the first half of the year was, in the main, attributable to increased demand in Japan, in the rechargeable battery sector. Cobalt demand in other Japanese end-use sectors was similar to that in 1999. Fears of a slow down in the economy caused a softening in demand in the December quarter of the year and consumers began reducing their inventories. The announcement by a major manufacturer of rechargeable batteries that they would be substituting cobalt with nickel and/or manganese in Li-ion batteries did not appear to impact on demand significantly. Overall, total cobalt demand in Japan, increased slightly over that in 1999.

Initial data, based on import/export figures suggest that Chinese demand increased substantially over that of 1999. However, it is not known how much of this, if any, was delivered into the national stockpile. Cobalt demand in other Asian countries increased slightly over that of 1999, the increase being seen predominantly in catalysts for manufacturing terephthalic acid and dimethyl terephthalate for the plastics industry.

Demand for refined cobalt in the US was similar, or slightly less, than in 1999. Small increases were noted in the superalloys and

cemented carbide sectors but these were offset by reductions in the magnet alloys and chemical sectors. In the first three quarters of the year, demand was slightly up on the comparable period of 1999. However, the onset of a slowdown in the US economy in the December quarter resulted in a slow, but steady, decline in demand as consumers reduced their inventories and limited spot purchases of metal.

Demand in Europe was slightly up on 1999, increases being noted in all alloy and hard metal sectors.

### **The Environment**

During the year, the European Union considered a number of health, safety and environmental issues relevant to cobalt.

Under Directive 67/548/EEC, cobalt sulphate and cobalt chloride are classified as category 2, highly potent, carcinogens by inhalation. Early in the year, the EU working group on classification and labelling met to consider whether these compounds should be placed on the list of dangerous substances under the Seveso II directive. Based on the information supplied by the CDI via Eurometaux, the working group concluded, that both compounds are not 'single shot' carcinogens, and should not be added to the list of dangerous substances.

Later in the year, the EU working group, considering the limitations on marketing and use of dangerous substances and preparations, met to consider whether or not cobalt sulphate and cobalt chloride should be

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subjected to marketing restrictions on the basis of EU Directive 76/769 concerning the marketing and use of certain dangerous substances and preparations. After the consideration of information supplied by the CDI via Eurometaux, the working group agreed that these substances should not be included in the directive as they were sold purely for professional purposes.

An extensive review to identify areas where further investigation and research is thought to be necessary to answer legislators questions concerning health, safety and environmental issues related to cobalt, and its compounds, has been carried out by the Cobalt Development Institute. As a result of this review, a number of long- and short-term research projects have been initiated.

### Price

At the end of 1999, the cobalt price stood at US\$14.70/lb and US\$13.20/lb for high-grade and low-grade metal respectively.

In January 2000, prices for both grades began to increase in line with firming demand. Prices rose steadily to peak in April at US\$17.20/lb and US\$15.72/lb for high and low-grade metal respectively. During this period, the price differential varied between US\$1.40/lb and US\$2.40/lb reflecting the relative availability of the different grades of metal at any given time. Thereafter, prices declined slowly through the summer holiday period in the northern hemisphere only increasing slightly following the announcement by Falconbridge of a strike at its Canadian operations in early August.

The price for high-grade metal further increased, following the announcement of *force majeure* on its cobalt deliveries, by Falconbridge, in early October. The increase in the high-grade quotation resulted in the price differential between the two grades of metal widening to US\$3.46/lb in October. However, fears of a shortage of high-grade metal proved unfounded and only half of the high-grade metal offered by the DLA in its

October and November solicitations was purchased.

In November and December, prices of high and low-grade metal declined steadily to end the year at US\$13.63/lb and US\$11.16/lb respectively. These prices were about US\$3.0/lb lower than at the end of 1999.

### National Stockpiles

The DLA continued to sell cobalt from the US Strategic Stockpile. In the calendar year, it sold 3,078 t, 844 t more than in 1999. Of this total, about 770 t was high-grade metal. In spite of offering about 560 t of high-grade metal in its October and November solicitations, sales of about 288 t were awarded.

At the end of 2000, the US Strategic Stockpile contained 9,297 t (20,495,517 lb) of cobalt of which about 5,018 t was high grade. Under the approved annual stockpile disposal plan, this total will enable sales to continue at the maximum rate for about three and a half years.

In the first quarter of 2001, the DLA sold 1,212 t of cobalt, of which about 454 t was high grade. Approximately 482 t were sold by negotiated bid.

No sales from other national stockpiles were recorded in 2000. In South Africa, 297 t of metal seized from Gécamines, in lieu of payment defaults, were sold in March, but this cannot be regarded as additional material as it would have been included in Gécamines' production figures.

### Outlook

The general outlook for 2001 is of increasing supplies at a time of softening demand as the industrialised economies slow down. In the first quarter of 2001, the high-grade cobalt price declined by about US\$1.80/lb whereas the low-grade price remained relatively stable. The decline in the price for high-grade metal, no doubt resulted from high DLA sales, and the news that the Falconbridge strike had

been settled. The lower prices are expected to reduce efforts to substitute cobalt with alternative materials and any softening in demand noted, will be related to the state of the economies of the industrialised nations rather than ongoing substitution efforts.

On the supply side, the high volume of sales by the DLA in the March quarter of 2001, coupled with the increased deliveries in 2000, suggest that some uncertainties in availability are expected. The assassination of President Laurent Kabila has raised doubts about availability of cobalt from the DRC. However, to date, this tragedy does not appear to have had an adverse influence on cobalt availability. It is understood that OMG is still on target to increase production in 2001, relying on feed material from its Big Hill project in the DRC.

Similarly, the fact that RAMC and Centaur Mining have been taken into liquidation does not appear to have adversely affected supplies to date. The feed materials from RAMC produce about 1,000 t/y of refined cobalt and any prolonged disruption in

supplies could impact on Zambian production. However, the commissioning of the slag treatment plant at Chambishi should more than offset any reductions resulting from a shortage of these concentrates.

It is understood that Murrin Murrin is still in the process of resolving a number of technical problems and it will not ramp up to full production until March 2002. Nevertheless, production is projected to increase steadily and will probably double in 2001.

Similarly, Kasese, although having a number of difficulties, is expected to improve production in 2001.

Summarising, in the short term a slight softening in cobalt demand, together with relatively steady supply, could result in a period of price stability. However, uncertainties in supply exist at a number of the established and newer operations and any firming in demand during the year could result in tightness in supplies from time to time.