

# TUNGSTEN

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Movements in the tungsten market in 2003 were mostly in the right direction as demand recovered again after the depletion of stocks in 2002 and consumption was boosted by a more optimistic view of the economy, even if prices were static after an initial surge. The continued industrial boom in China and the increasing need for tungsten domestically gave the country's concentrate producers more control over their material than hitherto, resulting in a sentiment that any concentrate shortage would have an adverse effect on China's development and thus demand the government's serious attention and exercise of control.

## **Production**

Production of concentrate (Table 1) in countries other than China and the CIS remained at the same level as in 2002 (nearly 6,000 t), the main producers being Austria (the Mittersill mine is part of an integrated operation and none of the 1,400 t produced is exported), Canada, Portugal and Bolivia. Imports are sourced from Africa but it is not clear whether the tonnage is from mines or stocks. Meanwhile, plans for future production continue to be addressed by prospective producers in Australia, Thailand and Vietnam (Table 1).

Production in China has been estimated as usual on the basis of demand for virgin material. A production figure for the CIS is not available but is estimated at 3,000 t. The Lermontov and Primorsky mines in Russia are the major producers, with additional material perhaps being sourced from Kazakhstan and Uzbekistan (Table 2).

Reported exports from China totalled 25,900 t in 2003, compared with 18,100 t in 2002.

In terms of the mix, tonnages were:

• Concentrates	150
• Oxides	8,700
• Tungstates	7,500
• W Powder	2,050
• W C Powder	2,550
• Ferro Tungsten	4,950

The report last year recorded plans by China's Ministry of Land and Resources to examine proposals by the CTIA to curb mine production and to limit the operation of conversion plants, thereby going to the root of the problem of over-supply rather than a licensing export system easily circumvented. Official efforts to resolve problems there by licensing, controlling production etc, continue.

Another factor of interest has been the consolidation of enterprises within the industry (a pattern by no means exclusive to China), leading notably to the creation of the China Rare Earths and Rare Metals Group, a joint venture between the largest producer and the largest trading company. The impetus for such mergers has been China's accession to the WTO and the further opening up of the country to foreign competition.

Export statistics are now published by Russia, which greatly helps to clarify the supply picture, and some 3,600 t were exported in 2003 (compared with 1,850 t in 2002) with the tonnage mix as follows:

- Concentrates 2,250
- Oxides 900
- Tungstates 450

Reportedly, exports are now sourced from current production rather than stockpiles.

Sales from the US Defense National Stockpile Centre (DNSC) amounted to 891 t (710 t of concentrate, 165 t of ferrotungsten and 16 t of wolfram powder) mainly to US companies and a permanent electronic facility was introduced to sell material on a spot basis. At the end of the year, the stockpile consisted of 30,000 t, almost entirely of concentrates.

### **Demand and consumption**

Demand is calculated by the addition of:

- reported imports of concentrates by the market-economy countries, ex-world;
- reported imports of intermediate products from China and the CIS and these countries' own export data.

Tungsten consumption is dependent on a healthy industrial climate, with its main uses being in cemented carbides, alloyed steels, super alloys, electrical and electronic products. End-use sections are estimated in Table 3.

Tungsten is a metal of many superlatives. It has not only the highest melting point of all elements except carbon – sources in scientific literature vary between 3,387°C and 3,422°C – but also excellent high temperature mechanical properties and the lowest expansion coefficient of all metals. A temperature of about 5,700°C is needed to bring tungsten to the boil, which corresponds approximately to the temperature of the sun's surface. Tungsten is also among the heaviest metals. Its electrical conductivity at 0°C is about 28% of that of silver, which itself has the highest conductivity of all metals.

Tungsten is an essential commodity whose unusual properties make an important contribution, through its use in cemented carbide and high-speed steel tools, to the achievement of high productivity levels in metal and wood-working, construction, mining and wear protection, on which the world's economic well-being depends. In the household, tungsten is used in light bulbs, television sets, magnetrons for microwave ovens and other electrical consumer products. Other applications include chemical uses, mainly in the form of catalysts.

Demand reflects the supply of the raw material to the market in a specified period, whether purchased for consumption or stocks. In other words, track is kept of annual concentrate production and supply, ex-stock worldwide, in order to evaluate demand by geographical area (Table 4 refers).

Actual consumption, including recycled material, is much more difficult to assess. The consumption of scrap is very high in several companies in the Western world and a figure of 25-30% is regularly used as an overall average to add in to the demand statistics. To some extent, the recovery of scrap depends on the price of cobalt: if low, scrap is not worth recovering and more use of virgin material results; but the scrap will accumulate and, when the cobalt price makes it worthwhile, it will be processed. Companies keep data confidential, however, and the best guide is the ITIA's quarterly summaries. Although the exact figures are confidential, the reported consumption of scrap represented 63% of ammonia paratungstate (APT) production amongst companies that contributed data in Europe, Japan and the US in 2003.

In Europe, the statistics rely mainly on reported exports by China and Russia, although data from major consumer countries such as France, Germany and Sweden correlate fairly well. Demand, at 8,050 t, fell dramatically in 2002 as stocks were deployed, but consumption was strong and demand was forecast to recover in 2003 - as indeed it did by 88% to 15,150 t.

It is particularly important in the case of Europe to remember the difference between demand and consumption. Demand over a period of years should be analysed to assess real consumption and account must be taken of the high proportion of recycled material (above the worldwide average). A low level of demand in one year does not imply low consumption.

These figures cover the EU but exports to the countries formally known as 'Eastern Europe' amount to an additional 250 t of intermediate products.

The anti-dumping duty on tungsten carbide from China, which expired on April 10, is being reviewed by the EU. It will remain in place pending a decision in 2004.

In Japan, data are reported, with import of intermediate products from China and concentrates mainly from the CIS. Demand of 5,950 t is slowly increasing (up 9% over 2002) as consumption of hard-metal tools in the auto industry improves and the IT industry continues to grow.

In the US, data are reported, with imports of intermediate products almost entirely from China and concentrates from Canada and the DNSC. As with Japan, there are different views about the strengthening of the economy and demand has shown only a marginal 7% increase over 2002 to 8,850 t. According to the USGS, apparent consumption of tungsten in all forms was 11,700 t in 2003 compared with 11,900 t in 2002, with over 50% used in cemented carbide parts for cutting and wear-resistant material primarily in the metalworking, oil- and gas-drilling, mining, and construction industries. The remaining tungsten was consumed in making heavy-metal alloys; lamp filaments, electrodes, and other components for the electrical and electronics industries; steels, superalloys and wear-resistant alloys; and chemicals for catalysts and pigments.

In China, a consumption estimate of 10,000 t has been used for many years but has been revised upwards for 2003 by 33%, to 13,000 t, given the requirements of the country's rapidly developing infrastructure for tungsten in the hardmetal, steel and electronic industries.

Domestic consumption in the CIS remains an unknown factor but has been estimated at around 3,000 t; presumably it will increase as the country's economy and industrial activity continue to recover.

Elsewhere, with data sourced to China's export statistics, the principal consumer was the Republic of Korea (2,500 t), followed by Israel (700 t of oxides and powders), Taiwan (250 t, mainly ferro- tungsten), India (200 t, mixed products), Brazil (200 t of ferrotungsten), Turkey (200 t of oxides); the overall increase was 21% over 2002 to 5,200 t.

### **Prices**

*Metal Bulletin* quotations for tungsten (Table 5) moved upward during the first quarter but thereafter remained more or less static.

Tables 1-5 following pages.

**Table 1: Mine production (t)**

		<b>2002</b>	<b>2003</b>
(w)	Africa	350	250
(s)	Austria	1,400	1,400
(w)	Bolivia	450	300
(s)	Canada	2,800	2,850
(w)	Myanmar	-	50
(w)	Peru	50	50
(w)	Portugal	700	700
(s/w)	Thailand	50	100
(s/w)	Other	100	-
	<b>Sub Total:</b>	<b>5,900</b>	<b>5,700</b>
(s/w)	China (est.)	28,200	37,500
(s/w)	CIS (est.)	3,000	3,000
	<b>TOTAL:</b>	<b>37,100</b>	<b>46,200</b>

s/w = scheelite/wolframite

**Table 2: Sources of supply (t)**

	<b>2002</b>		<b>2003</b>	
China	28,200	76%	38,700	79%
CIS	1,850	5%	3,600	7%
MECs	4,550	12%	5,700	12%
DNCS	1,800	5%	900	2%
Other	700	2%	200	-
<b>TOTAL:</b>	<b>37,100</b>		<b>49,100</b>	

**Table 3: Estimated consumption by end-use sectors**

	<b>Western Europe</b>	<b>Japan</b>	<b>US</b>	<b>China</b>	<b>CIS</b>
Hardmetals	62%	53%	66%	41%	55%
Steels / Superalloys	24%	12%	9%	35%	30%
Mill Products	6%	7%	16%	16%	10%
Other	8%	28%	9%	8%	5%

**Table 4: Demand for virgin tungsten**

	2002 (t)	2003	Market Share
Western Europe	8,050	15,150	31%
Japan	5,450	5,950	12%
US	8,300	8,850	18%
Other Market Economies	4,300	5,200	11%
<b>Sub-Total:</b>	<b>26,100</b>	<b>35,150</b>	
China - Domestic Consumption	10,000	13,000	27%
- Imports of Concentrates	900	700	1%
Other	100	250	-
<b>TOTAL:</b>	<b>37,100</b>	<b>49,100</b>	

**Notes:** - Consumption in the CIS and DPR Korea is not known and is excluded.  
- 'Other' includes exports of products by China to E Europe and DPR Korea.

**Table 5: Metal Bulletin quotations**

	US\$/	End 2002	End 2003
Concentrate	mtu WO <sub>3</sub>	32 – 45	42 – 50
APT (US)	mtu WO <sub>3</sub>	64 – 69	66 – 73
APT (Europe)	mtu WO <sub>3</sub>	48 – 52	62 – 66
FeW (Rotterdam)	kg of W	5.60 – 5.90	6.85 – 7.10

Note: The US ammonium paratungstate (APT) quotation has been converted from stu to mtu for comparison purposes.