

TUNGSTEN

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The tungsten market in 2001 benefited from a 14% increase in demand. Consumers feared further price rises and a shortage of supplies in the face of the impact of the Chinese Government's restrictions on exports via a licensing system. Despite concerns over the economy, an obvious driving factor, consumption appeared to remain strong, at least in Europe and the US. The largest mine in the Western world announced plans to re-start production in January 2002. Other producers also announced interest in opening or re-opening mines but, given the need for sustainable prices over a long period, initial enthusiasm may have waned by the end of 2001.

After a long, lean spell, the mines in China will above all have benefited from 12 months of prices well above their production costs and supply of concentrate met the demand from domestic converters who, in turn, met worldwide demand for intermediate products. Supply was supplemented by releases from stockpiles in the CIS and US and a marginal increase in Western production.

The price spike in July 2000, last seen in 1994/95, was maintained through May 2001 but, thereafter, the Metal Bulletin quotations fell steadily.

Production of concentrate in countries other than China and the CIS rose slightly in 2001 to 3,200 t. Austria and Portugal remain the only notable producers and concentrate from the Mittersill mine in Austria is used as part of an integrated operation, none of it being exported.

In 2001, the owners of the Canada Tungsten mine (Cantung) in the Northwest Territories announced plans to re-open the mine and resume production as soon as possible following a deal with two major consumer

companies which would be entitled to purchase the full output in return for financing and a guaranteed floor price. Cantung has a capacity to produce at least 3,000 t/y and has been on care and maintenance since 1986. Production was scheduled to start in January 2002 and the deal reflected consumers' concerns over rising prices and China's restriction on exports. Interest in increasing production from existing resources and exploring new resources has also been expressed by other companies in Australia, Spain and Vietnam.

Mine Production (t)

		2000	2001
(s)	Austria	1,400	1,450
(w)	Bolivia	400	500
(w)	Mongolia	50	50
(w)	Myanmar	50	-
(w)	Peru	50	50
(w)	Portugal	750	700
(w)	Rwanda/Uganda	100	150
(s/w)	Thailand	50	150
(s/w)	Other	50	150
	Sub Total:	2,900	3,200
(s/w)	China (est.)	32,550	38,550
(s/w)	CIS (est.)	3,000	3,000
	Total:	38,450	44,750

s/w = scheelite/wolframite

Western producers have been awaiting the chance to return to the scene, either by increasing existing production or developing resources. In both cases (particularly the latter), a sustainable price improvement has to be envisaged, so whether the current price decline will dampen initial enthusiasm remains to be seen.

Production of concentrate in China has been calculated at 38,550 t in order to match worldwide demand for tungsten. That figures in recent years are higher than those reported officially is given credence by Chinese sources themselves, as the official data covers only mines owned by the State or provincial governments. Reflecting the above comments about Cantung, two major converters in China announced joint ventures with mines.

With regard to the CIS, no data is available but production is estimated at 3,000 t. The Lermontov and Primorsky mines are the major producers, with additional material perhaps being sourced from Tyrnyauz and the Kazakstan and Uzbekistan regions, with all production being consumed domestically.

Sources of Supply (t)

	2000		2001	
China	33,050	75%	39,000	80%
CIS	5,350	12%	3,950	8%
MEC production	2,900	6.5%	3,200	6%
DLA	2,600	6%	2,500	5%
Other	300	0.5%	350	1%
TOTAL:	44,200		49,000	

Reported imports by the West from China in 2001 totalled 29,000 t compared with 23,150 t in 2001. The former figure is much higher than China's recorded exports (22,100 t). Over the years, there has been a good match between China's export statistics and the data gathered by the International Tungsten Industry Association (ITIA) from importing countries, but the probability in 2001 of material being smuggled from China to avoid the licensing system and to benefit from the price surge explains the difference.

Notable variations in the type of material imported from China between 2000 and 2001 have been imports of concentrates (1,550 t, mainly into the US, compared with 100 t in

2000); oxides (10,250 t compared with 7,700 in 2000); and W/WC powders (4,500 t compared with 2,750 t in 2000, mainly because of increased demand in Europe).

Supplies continue from the CIS, mainly concentrates and oxides. To end 2001, from 1992 when CIS exports first hit the market, some 48,000 t of W have been exported and the guessing game continues as to the size of remaining stocks and the government's policy regarding sales.

In 1999, the US National Defense Stockpile was authorised to sell its entire stock of tungsten, which stood at 37,330 t, no sales having been made since 1989. The stockpile mainly comprises concentrate, the quality of which is uncertain. Sales took place in 2001 of 2,500 t in accordance with the Defense Logistics Agency's annual materials plan (AMP), leaving about 30,000 t tungsten in the stockpile.

Whilst authorisation has been given to sell, the DLA has a mandate not to disrupt markets, and consultation takes place with industry on a regular basis with regard to tonnages and prices. With such a large amount of tungsten at its disposal (the original tonnages represented nearly one year's worldwide demand), the DLA has a difficult game to play in reconciling the various and different interests of a fragile industry.

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, and armaments.

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.

Demand for Virgin Tungsten (t)

	2000	2001	% Market Share
Western Europe	12,350	17,600	36%
Japan	8,000	6,850	14%
US	8,950	9,700	20%
Other Market Economies	4,500	4,300	9%
Sub-Total:	33,800	38,450	
China	10,000	10,000	20%
domestic consumption			
China-	300	400	1%
imports of concentrates			
Other	100	150	-
TOTAL:	44,200	49,000	

Note: 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.

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. Actual consumption, including recycled material, is much more difficult to assess. The consumption of scrap is very high for several

Western companies and a figure of 25-30% is regularly used as an overall average to add in to the demand statistics.

Estimated Consumption by End-Use Sectors

	Western Europe	Japan	US	China
Hardmetals	62%	51%	60%	60%
Steels / Superalloys	24%	21%	21%	25%
Mill products	6%	8%	15%	8%
Other	8%	20%	4%	7%

Overall, demand for virgin tungsten in the market economy countries rose in 2001 (by 14%) to 38,450 t. This apparently welcome increase, following another 10% in 2000 over 1999, has to be viewed in the context of the price spike through June 2000 - May 2001, occasioned by China's imposition of licensing controls over exports. Consumers were anxious to source supplies and generally formed an opinion that China's restrictions and the resulting increase in prices would be sustained. The reality was clear towards the end of 2001 and, as consumption depends on the economy which began to falter (even in China) in 2001, it is difficult to assume any other situation than that stocks have been accumulated. Such remarks apply to all the areas mentioned below.

In Western Europe, demand for the raw material increased from 12,350 t in 2000 to 17,600 t in 2001. As always, the statistics remain opaque in terms of real consumption: it was strong but only the demand data in 2002 will determine its real strength. Material was sourced from China (12,450 t), CIS (3,000 t) and 'Other' (2,150 t).

In Japan, demand at 6,850 t in 2001 reflected a fall of 17% following massive purchases in the second half of 2000; material is mainly sourced from China. The fragile state of the Japanese economy is not a conducive factor to strong consumption.

In the US, demand increased by over 8% to 9,700 t, compared with 8,950 t in 2000. According to the US Geological Survey, real consumption remained at the same level as in 2000, about 14,300 t including recycled material (ie a further 32% on top of virgin tungsten), despite fears over the economy after a decade of strength. As mentioned earlier, imports from China of concentrates rose dramatically, followed by tungstates and W/WC powders. On the other hand, imports from the CIS fell to 400 t compared with 2,000 t in 2000.

China and the CIS are imponderables. A figure of 10,000 t/y has been used for China based on a domestic industry estimate some years ago. A more recent estimate suggests that 8,000 t/y may be more accurate but, for the sake of statistical continuity and in the absence of definite data, the original figure has been used.

No estimates are given for the CIS where it is assumed that local production is consumed internally. DPR Korea is also an unknown factor but imports of concentrates and FeW have been reported by China, so a tungsten industry must exist.

Elsewhere, demand seems to have fallen marginally (4,300 t in 2001 compared with 4,500 t in 2000), with the Republic of Korea the major consumer. Other countries include Israel (high on imports of W and WC), South Africa, Brazil, India, Pakistan, Taiwan and Turkey.

***Metal Bulletin* Quotations**

US\$/		Jan 4, 01	Dec 31, 01
Concentrate	mtu W_{O_3}	55-65	40-50
APT (USA)	mtu	90-94	81-88
APT (Europe)	mtu	83-86	64-77
FeW (Rotterdam)	kg of w	5.50 - 5.80	5.60 - 5.70

Note: The US ammonia paratungstate (APT) quotation has been converted from stus to mtus for comparison purposes.

The *Metal Bulletin* quotations for ammonium paratungstate (APT), which are the best reflection of the market, rose until end-May, peaking at US\$95-97/t in Europe, with the most rapid decline occurring in November and December as China lowered its floor price for APT as smuggled materials forced down official prices.

General Comments

In the year 2000 edition of Mining Annual Review, the restrictions on exports of tungsten imposed by the Chinese Government were summarised and comment made on the fact that the full implications would only be apparent in 2001. Rising prices and strong demand resulted in the first half of 2001 as a consequence of these factors. However, prices declined in the second half as importers of Chinese material found suppliers willing to export despite restrictions in an effort to retain their long-term customers. That other suppliers might be coming into the market posed a threat.

Meetings in China have been held at which the serious concern of the Central Government was again expressed over the lack of management of tungsten production and illegal mining. Production regularly and substantially exceeded annual demand; the recovery rate was about only 43% for the state-owned mines and as low as 25% for the small independent mines; environmental damage was serious from the uncontrolled discharge of waste and tailings; and the readily-mined reserves in China had only ten years of life if current production was maintained at its present level and no new developments took place.

Imports from the CIS in 2001 were lower than in 2000 but continued despite many reports in the market that supplies had practically ceased. There may be production resources which could be developed to supplement exports in addition to domestic consumption if prices make it worthwhile.

Plans by companies outside China and the CIS to resume or develop production of

concentrate are likely to raise the stakes within these two countries (China in particular) to resist the competition and the depletion of their market share. The reaction of the Chinese Government to pressure from its domestic industry to increase export quotas is being watched with interest.

That production of concentrate continues to be augmented by supplies from stockpiles in the US and the CIS is true and both will eventually run out. In the case of the US, it will take at least ten years, given the DLA's current AMP. In the

case of the CIS, no one (outside a privileged few in the CIS) knows. But to maintain the view that production in China cannot fill any shortfall in the meantime may continue to be an error, given the statistical evidence.

The fall in prices in the second half of 2001 reflected aggressive sales by suppliers and economic frailty worldwide. The period mid-2000 to mid-2001 proved what China, as the major supplier of tungsten, could achieve. The second half of 2001 was evidence of an effort which could not be sustained.

International Tungsten Industry Association 9th International Tungsten Symposium will be hosted by Kennametal Inc. in Pittsburgh, US, September 30 to October 4, 2002.