

Cutting edge recycling

Ever thought about recycling your used tungsten carbide cutting tool tips/tools? Cutting tool manufacturers will increasingly be encouraging you to do so. SteedWebzell reports

The world price of tungsten raw material has more than quadrupled in recent years to reach an all-time high. China is responsible for around 85 per cent of the world's output of the raw material – its output is over nine times more than the next largest producing region – and the country is also a prominent consumer. Both activities mean the country has a significant effect on market prices (see market analysis box item, page 21).

Now while independent companies have been active in tungsten carbide reclamation for a while and carbide tip producers have made use of tungsten carbide powder from such sources, recycling is now attracting considerably more attention from carbide tip producers to damp down high carbide prices, ensure security of supply and reduce consumption of non-renewable raw materials. Some are building their own recycling plants and collecting tips from customers in a more structured

fashion, not just recycling scrap material internally.

Ceratizit, which use to have its own tungsten mines, is one of the most proactive cutting tool manufacturers in this area. The company is currently constructing a new production building dedicated to the reprocessing of tungsten carbide scrap at its Reutte facility in Austria. The operation is due to go into production in the middle of this year. In recent months the company has developed a new powder waste treatment process that will enable tungsten carbide to be produced industrially from recycled materials in the required grain sizes for the first time.

HIGH PRIORITY STRATEGY

Ceratizit says that due to the continuing high prices for tungsten oxide and tungsten metal powder on world markets, in line with the company's strategy of further safeguarding raw material

availability, recycling of production scrap into usable raw materials has now been assigned high priority.

At the beginning of 2005, a team of Ceratizit engineers and metallurgists began work on a global concept for recycling of production waste. During development it soon became clear that a proven, reliable process should be used for recycling of 'hard' metal scrap (sintered waste products), but no satisfactory solution existed for recycling of 'soft' metal scrap (non-sintered and pre-sintered residues and waste products from grinding).

To overcome this difficulty the team devised a completely new process approved by the Austrian department of the environment. Laboratory tests were followed by the



development of the necessary plant engineering for the industrial reclamation of tungsten carbide from soft metal scrap.

"The cost of APT [ammonium paratungstate – the main intermediate product] in 2004 was \$100 per tonne; today it stands at \$280-300 per tonne, so there was an urgent need to find a solution to recycle finished product," says Vince Kelly, managing director of Ceratizit UK. "Price hikes are a function

The truth about tungsten

Tungsten ore is mined underground and processed at the mine site using crushing and gravity separation to produce tungsten concentrates. These concentrates are then sold and processed chemically to produce ammonium paratungstate (APT), which is the main tungsten intermediate product. The other subsequent intermediate tungsten products are:

- Tungsten metal powder – wire, rod and sheet are primarily made from powder;
- Ferrotungsten – most ferrotungsten is produced by powder metallurgy using a mixture of iron and tungsten powders. Ferrotungsten typically contains between 25 and 75 per cent tungsten;
- Tungsten carbide – produced by carburising powder in a heated, carbon atmosphere, it is the most important tungsten compound in terms of volume and it is the main constituent of cemented carbides.

of the market, with China playing a major role in this mechanism," he adds. "Ceratizit as a major user is very aware of price sensitivity, which is why this investment in recycling has been made. As much as 25 per cent of the market demand for tungsten carbide could be satisfied by reclamation."

Ceratizit intends to involve its customers in the recycling process by buying back scrap products in various forms. These include finished product such as used indexable inserts, waste product from solid carbide drill production and carbide sludge from machining centres.

"Our major customers in Germany are already participating in a pilot project that will be rolled-out to UK customers in the near future," says Mr Kelly. So what grades can customers expect to find on offer from the recycling programme?

According to Mr Kelly, the 'mix' of grades being reclaimed will not affect the quality of the output, thanks largely to modern technology. "It's a matter of control," he says. "In the process developed by Ceratizit, intelligent technology is deployed to attain levels of control far higher than previously possible even five years ago. The resultant material allows many premium grades to be produced."

RECYCLING SUPPORT

The situation is seen as a win for all concerned. End users will be drawn to recycling programmes for scrap and worn tooling for a number of reasons, including cost-saving measures and to help comply with environmental considerations. The message is: it is time for manufacturers to think again about throwing carbide tips into the general metal 'mix' to be sold as scrap.

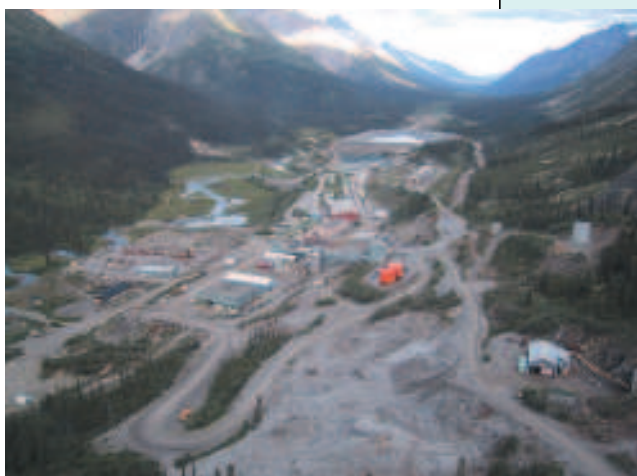
One company that has found success with its new carbide recycling programme is Kennametal. "We've endorsed and practised carbide recycling for a while but it wasn't as systematic or



efficient as it could be," explains Pankaj Khare, senior product manager of Kennametal Inc. "By comparison, the current carbide recycling programme, launched in July 2005, is very straightforward and easy to use. It also is web-enabled, so large and small machine shops around the world have direct programme access.

For Kennametal, tungsten carbide recycling "completes the loop in supply-chain efficiency for the customer while emphasising ease of use for increased participation", according to Mr Khare. At www.kennametal.com/carbiderecycling, customers can locate the latest rates for used carbide (currently around £1.90/kg of used carbide inserts). After submitting an on-line form, users can print a shipping label and send the materials to Kennametal with a confirmation number. Qualified used carbide includes mixed coated and uncoated metalcutting inserts, free of chips, oil and steel contamination and braze.

Benefits of the Kennametal recycling programme include cash back, invoice reduction or new tooling, depending on customer needs. Additional good news is that used carbide from any source is eligible for Kennametal's global recycling programme – the company says it can



recycle to a purity that allows the resultant material to be used in the production of premium grades.

Kennametal is clearly concerned

TaeguTec's tungsten market analysis

The effect of rising tungsten prices is causing concern generally across the tooling sector. TaeguTec owns its own mine at SangDong in Korea (300 km east of Seoul) but it has been closed since 1992 (a period of general decline following huge demand and subsequent market saturation in the 1980s).

"There are still abundant tungsten resources at SangDong mine," says Un-Jic Shin, director for industrial product marketing at TaeguTec, "but, it is not easy to re-open the mine due to the high investment needed and the very volatile market situation."

Mr Shin points out that China satisfies some 80 per cent of world raw material demand for tungsten carbide, and has almost 60 per cent of world tungsten resources.

"The price for APT has risen unreasonably in a short time from \$65 per tonne in January 2004 to \$265 per tonne in April this year," he says. "This sudden change of price has been due mainly to the speculation and market manipulation taking place in China. The cost of mining tungsten concentrate in China is known to be approximately \$30-40 per tonne, and in the past Chinese tungsten concentrates were sold at slightly higher than their cost or even under the cost. But, surprisingly, the selling price of tungsten concentrates in China nowadays stands at above \$200 per tonne. There is no specific logic or reason for this kind of price upsurge in such a short time. Everyone in the market says that the price should drop, but no one can tell when. As a consequence, all carbide tooling manufacturers worldwide have been hit by absurd and unreasonable price hikes without exception."

Mr Shin says that there is a growing 'murmur' of activity in Western tungsten mines that, if it accelerates, would help remove some of the control from China and help stabilise the market. This is currently taking three courses: existing Western mines pushing tungsten output to the maximum; closed mines such as CanTung in Canada re-opening (below) – this is now the Western world's largest tungsten ore producer at 3,000 tonnes per year, it is reported (world production is between 60,000 and 80,000 tonnes); and the discovery of new tungsten deposits in locations such as Australia, Portugal and British Columbia, Canada.

"Although TaeguTec is not currently recycling, the company is very mindful of the present volatile tungsten carbide market and is taking as many measures as possible not to be hit seriously by these kind of manipulated situations," concludes Mr Shin.

about the rising price of tungsten, as president and CEO of Kennametal Inc, Carlos Cardosa, confirms: "A major challenge for the industry in 2006 continues to revolve around raw material costs, especially tungsten."

Sandvik AB is similarly concerned. Chief executive Lars Pettersson recently warned that the company's Tooling

Division will likely incur increased costs in some quarters this year due to higher priced tungsten. He added, however, that he is not unduly concerned about the outlook for raw material prices in 2006, and expects them to increase across the group by 2-4 per cent, in line with 2005.

Nevertheless, Sandvik Asia Ltd (SAL), a subsidiary of Sandvik AB, is setting up a cemented carbide recycling plant at Chiplun, on the Konkan coast in India (south of Mumbai). The plant will recover precious metals, like cobalt and

tungsten, from cemented carbide inserts and other solid carbides. The 100 per cent export oriented unit (EoU) is scheduled to go on stream this summer. Sandvik will collect used tools (both Sandvik and competitor grades) from its customers and ship them to India. The material recovered will be exported, hence its EoU status. The recycling is expected to help save up to 25 per cent of virgin raw material.

Although the plant at Chiplun will further enhance Sandvik's recycling capability, the company has been proactive for some years in encouraging manufacturers to recycle used carbide inserts. With its worldwide Coromant Recycling Concept (CRC), Sandvik offers a comprehensive, easy-to-use and free-of-charge service to its customers that also includes solid carbide tools, even allowing some contamination of CBN and PCD if the 'carrier' is cemented carbide. Using CRC, all used hard metal materials are collected in boxes placed by the machine tool. Once full, the contents are transferred to a transport box that is returned to the nearest Sandvik Coromant office (or distributor) and then back to the Coromant manufacturing plant for recycling.

"In the light of increasing consumption of non-renewable raw



Ceratizit's tungsten carbide recycling plant goes up in Austria. The company is piloting a customer tip recycling programme in Germany and will roll it out in the UK soon

materials, the economic management of dwindling resources is a duty owed by all manufacturers," claims Jason Purcell, Sandvik Coromant UK's customer service manager.

CUSTOMER UPTAKE

"Our customers are becoming increasingly aware of the need for recycling of carbide products and the CRC system enables us to return not only Coromant products but also those from

other suppliers. The take-up is growing and we are encouraged by this," he adds.

Many tooling companies opt to appoint tungsten specialists to handle their tungsten carbide reclaim services. For instance, Alabama-based ATI Alldyne performs all of Stellram's reclaim services. ATI Alldyne (www.metalworkingproducts.com), a sister company to Stellram, has a long history of recycling of WC/Co powders, grade powders, and operates an extensive scrap programme. "We use reclaim powder in a large number of our grade powders, which are used throughout the industry, including some Stellram parts," says Andy Alper, technical marketing manager ATI Alldyne. "Interestingly, many of the reclaim grades outperform virgin WC formulations," he adds. The IMC Group (see page 17) likewise uses independent recyclers.

So while there is little relief from spiralling prices for tungsten carbide at present, the acceleration of recycling programmes by the world's leading tooling manufacturers is one factor that will mitigate the impact on carbide tool manufacturers and, hence, on their users' costs. □

Indexable switch delivers solid savings

It would seem that some manufacturers are moving to indexable tools to avoid the recent steep price rises for solid carbide tooling – so says Ingersoll Cutting Tools, which supplies both types. "There is a definite shift towards indexable drills and milling cutters triggered by the rise in solid carbide tooling prices," says Chuck Elder, Ingersoll executive vice president in the US. "We hear it from supply chain managers and distributors, and are seeing it in our own sales figures."

Ingersoll says that prices for indexable tooling have remained relatively stable since these tools contain only 10 to 15 per cent tungsten carbide. "At present carbide prices, North American manufacturers could save about \$300 million a year in tooling costs alone by converting from solid carbide to indexable round tools," Mr Elder estimates.

A case in point is Global Gear and Machining of Illinois which makes 300,000 automotive drive train flanges a year. GGM cut its drill inventory from 600 solid carbide drills to just 20 indexable drill bodies and a supply of replaceable tips. The saving amounted to approximately \$205,000 a year all-told in drill inventory and reconditioning cost, with essentially a drop-in tooling switch, reports Ingersoll.

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