

Carbide recipes for success

Andrew Allcock travelled to Austria to visit the 'heart' of the LMT group, Boehlerit. As a mid-size carbide producer, it has a distinctive approach to business, and demand is booming

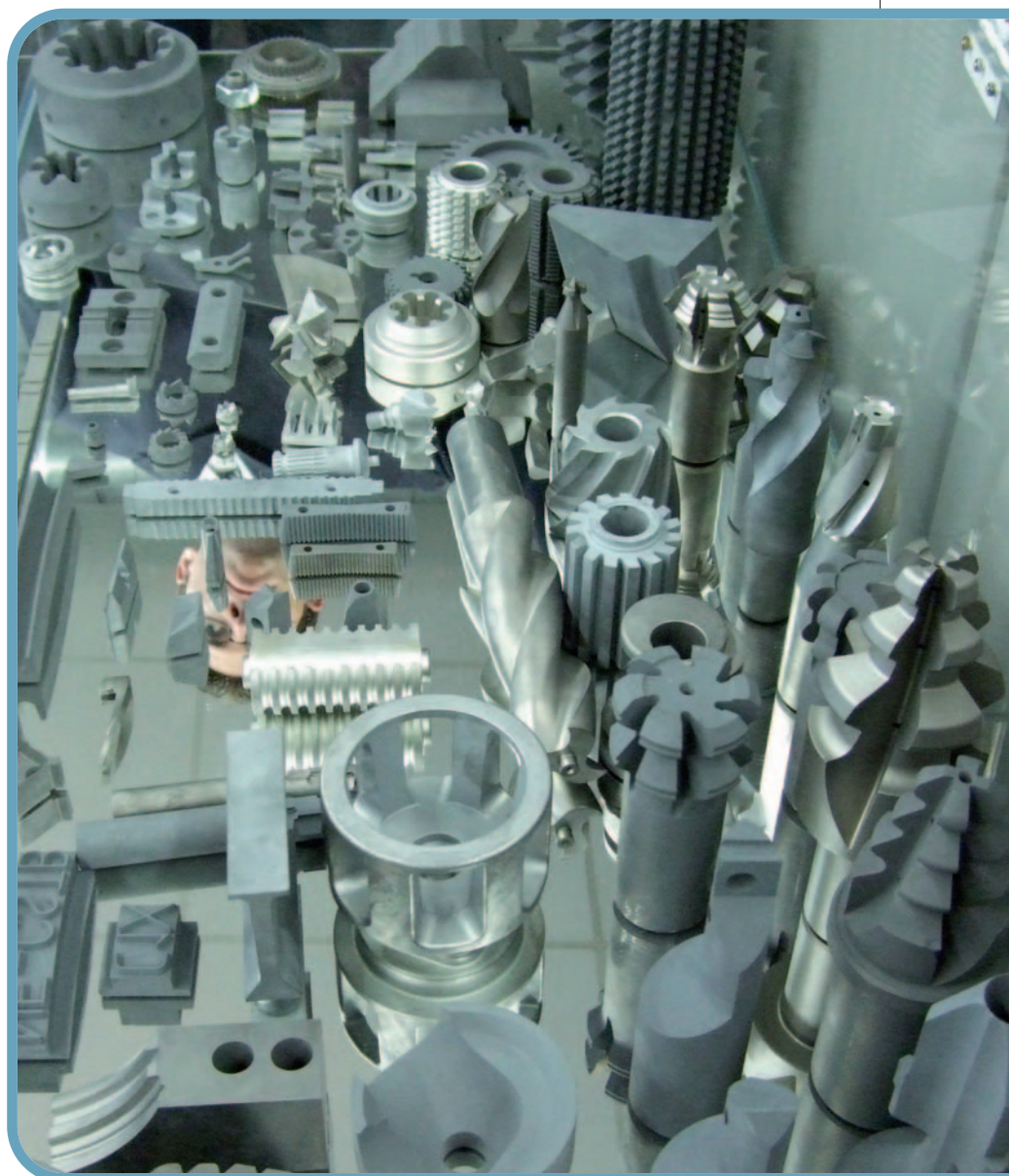
While the LMT group of companies' corporate headquarters – its 'head' – is located in Oberkochen, Germany, its 'heart' is very much Boehlerit in Kapfenberg, Austria. So says Gerhard Melcher, in charge of product management, cutting tools and marketing there. The reason is simple; Kapfenberg is where the carbide insert mixes and inserts themselves for the six-company LMT group (see box page 26) are made, and where inserts are coated.

Boehlerit has been in business for over 75 years and boasts a 22 per cent market share in its home country for cutting tools. It joined the LMT group in 1991, but the shift to its position as central producer and coater of carbide is more recent. It now has a capacity of 2,000 tonnes/year, although its output is around 100 tonnes/month, with the limiting factor being grinding capacity.

Boehlerit also makes and supplies inserts to non-LMT companies – as do other carbide mix/insert makers – but customer information about this is not made public, of course. Actually, only 27 per cent of Boehlerit's turnover is generated by the other five LMT group companies but fully 55 per cent of LMT group's sales are supported by Boehlerit-produced carbide, including wear parts that the company also produces.

The Kapfenberg-based firm was historically an activity within the steel making company Boehle, located at the

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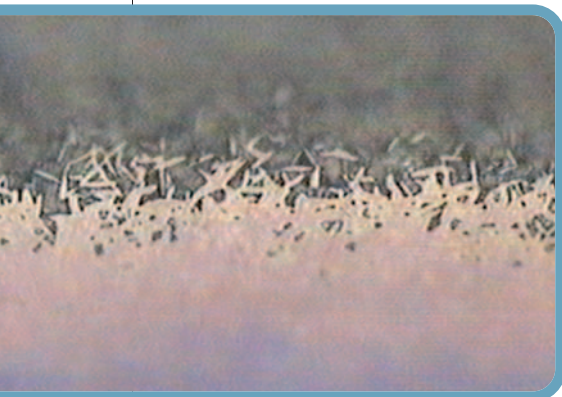
other end of the town. This association meant that its focus has been on heavy engineering activities such as bar peeling, pipe edge milling (prior to rolling and then seam welding) and main journal milling of large crankshafts for ships' engines, for example. It claims leadership in these activities and, with the oil (pipes), shipping (large crankshafts), and wind energy (inserts for gear machining supplied through Fette) industries booming, Boehlerit is fighting hard to satisfy demand.

Add to that the fact that 85 per cent of the carbide inserts used by Boehle are supplied by Boehlerit and that Boehle is quoting end-2009/beginning 2010 for its special steel products, and the picture of high demand is complete.

The six-company LMT group as a whole claims some 28,000 standard products across all its ranges, but standard products account for only 30 per cent of sales; the remainder are special tools. That proportion, says Mr Melcher, is more than completely the reverse compared to most other cutting tool makers where some 80 per cent of sales come from standards. Indeed, Boehlerit makes some 25,000 pieces per year for around 18,000 customers in its specials workshop (see picture on previous page).

A graphic example of Boehlerit's breadth of carbide expertise and its potential for product flexibility is the fact

Boehlerit's Nanolock coating offers a better mechanical bond between coating layers



LMT group companies

The LMT group (Leitz Metalworking Technology) comprises, six metalworking companies; all well known cutting tool makers in their own right and which have been brought together over recent years by family-owned Leitz, a specialist in woodworking cutting tools located at Oberkochen, Germany. In the UK the selling organisation is LMT-Fette (LMT-Fette is also one of the group companies), although it acts for all group companies and trades as LMT (UK). The LMT group comprises:

- LMT Belin, France – reamers and solid carbide tools for metals and plastics. It makes its own grinding wheels to make its tools.
- LMT Bilz, Germany – spindle connections
- LMT Boehlerit, Austria – carbide powder, all carbide inserts, all insert coating, cutting tools with a bar peeling, crankshaft milling and pipe machining speciality
- LMT Fette, Germany – HSS hobs (this company also has its own coating plant), plus also makes carbide presses for insert forming (up to 6 axes)
- LMT Kieninger, Germany – mould and die specialist, plus PCD and special tools for the automotive industry
- LMT Onsrud, USA – solid carbide, inch tools, aerospace strength.

Product R&D resides within each company, as does product development, but carbide materials R&D is centred at Boehlerit for both metalworking and woodworking tools. The strength of the group is that it is comprised of relatively small, specialist teams, says Mr Melcher, and it is policy to retain this focus and agility – “we do not want to be an elephant”. That said, collectively, the Leitz woodworking and LMT metalworking activities employ 6,500 worldwide, 3,200 in the LMT group of metalworking companies, 600 of those at Boehlerit, Kapfenberg. The group had a turnover of €650 million in 2006, the metalworking companies representing €380 million in 2006, with Boehlerit's share being €113 million of that, of which some €40 million was for wear parts.

that it boasts 120 basic carbide substrate mixes, 50 of which are for cutting tool purposes (others are for wear parts); other cutting tool carbide producers, says Mr Melcher, would have at most 30 – and some not even a third of that.

Moreover, Boehlerit's association with its steel producer neighbour means that it historically focuses on materials development rather than have product development driven only by end-user demands. And that is important.

In 1991, when the cutting tool market globally was valued at €4.5 billion, Frost & Sullivan and others forecast that by 2000 – due to the move towards smaller depths of cut and better tools – the market would shrink to €3.5 billion. In fact, as Mr Melcher is delighted to point out, the market was worth €5.5 billion in 2000 and is worth €7.5 billion today.

“Why?” he asks rhetorically, “because

of material development.” Materials have become more and more difficult to cut. “On tempered steel, a tool tip's life is 45 minutes; on austenitic steel it is 25 minutes,” he examples. “Even fuel injection systems are making use of Inconel 718 today; super-alloys such as Inconel, Hastalloy and Waspalloy are being used more widely, while the increasing use of composites in aerospace will also change the market.”

At the EMO exhibition last year, LMT group launched 30 new products, six of these being particular highlights, says Mr Melcher, with two of them picking up show awards.

The two awards went to LMT Fette's intelligent thread rolling system and to Boehlerit's Nanolock coating (pictured, page 26) – this had already picked up an Austrian Award, beating microelectronics companies which are normally successful

in the 'nano' technology field. The 'old' economy beating the 'new', as Mr Melcher offers, wryly.

The Fette thread rolling head with in-built sensor guarantees correct thread quality, eliminating both test equipment and related manning. In total, the process becomes 70 per cent faster, it is claimed.

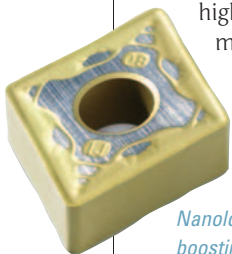
The Nanolock coating is particularly innovative and is the subject of two patents. And, crucially, it is in the area of coatings where most development in cutting tools will come in the coming three years, says Boehlerit – carbide powder improvements will be marginal, until the move from today's ultra-fine powders (0.6-0.4 micron) to nano-level carbide powders, but that is many years away. (Finer grains offer both improved toughness and hardness.)

Nanolock is a titanium carbonitride (TiCN) coating currently used on turning inserts. TiCN is applied to inserts to improve hardness and wear resistance, and in turning applications when tip temperatures experienced are high, an aluminium oxide layer (Al₂O₃) typically sits on top of the TiCN layer to provide a thermal barrier.

TiCN, a black coating, is most often applied by what is called the MT-CVD route – Medium Temperature Chemical Vapour Deposition. It is known that a reduction in its grain size improves TiCN's wear resistance, so Boehlerit set out to work along these lines, undertaking experiments at high temperature as opposed to medium temperature – High Temperature CVD (HT-CVD). After two years it created Nanolock, featuring two

Steeltec features Nanolock coating, boosting performance important phenomena. Apart from offering improved

mechanical properties, it also offers better mechanical adhesion between the TiCN and the Al₂O₃ coatings (cross-section, page 26) – so producing the



Austria's manufacturing economy



Austria is not, perhaps, the first country that springs to mind when you think of manufacturing in the EU; Germany retains that recognition. But, while most other industrialised nations see their manufacturing economy shrinking, as measured by proportion of GDP, Austria's manufacturing GDP actually climbed between 2003 and 2004, from 19 per cent to 21 per cent, according to the *Economist Intelligence Unit*.

The country has some 530,000 employed in manufacturing for a population of 8 million; pro rata for the UK would mean almost 4 million employed but the UK has 3 million manufacturing employees – so Austria has 30 per cent more people employed in manufacturing pro rata, which is also about how much bigger its manufacturing economy is versus the UK, measured by proportion of GDP.

And, according to a paper presented at the Research Centre International Economics, Vienna, December 2007, while in 1976 exports accounted for about 24 per cent of GDP (in real terms), this share increased to almost 58 per cent in 2006. The country's export share of GDP now stands above the average of the EU 27 at 43 per cent versus 31 per cent.

Graz, state capital of Stierermark (one of nine 'counties'), is the four-wheel drive car expertise capital of Europe, for example. Prestige car makers source their four-wheel drive versions from here, while many car components are also sourced from Austria by German car makers – some 14,000 are employed in the components business in the Graz area alone, Magna being a major employer. Kapfenberg is some 50 km north of Graz, incidentally.

And with the opening up of Europe to the east, Austria's location and history make it the gateway to these countries for many European companies – it borders Slovenia, Hungary, Slovakia and the Czech Republic. With just 4 per cent unemployed, the country effectively has full employment.



world's first nanocrystalline bonding layer.

Further, it was also discovered that there were coloured elements within the new coating, and a separate coloured layer is used to accurately indicate wear of the outer Al₂O₃ coating (which is also a black). Boehlerit is so far the only manufacturer to succeed in marking its indexable inserts with a layer of this kind, it is claimed.

So, on the company's Steeltec turning inserts (see left), first there is a MT-CVD TiCN layer; then the Nanolock, HT-CVD TiCN layer; then a layer of Al₂O₃; then a 'coloured' Nanolock layer; and finally another Al₂O₃ layer through which the coloured layer is visible.

The LMT Steeltec LC215K indexable inserts is capable of cutting speeds of over

300 m/min and registering a cutting life 50 per cent higher than conventional inserts when cutting steel.

More widely, the Nanolock development will be a central element of LMT group coating innovations for milling, turning, bar peeling and crankshaft machining.

Boehlerit is also set to reveal developments in PVD coating (typically used for interrupted cut applications like milling) – specifically, the ability to increase the aluminium content in TiAlN above 65 per cent, which positively benefits hardness, plus abrasion, and thermal and oxide resistance.

Boehlerit's profile in the UK is not high, but its expertise is a critical element in nearly all LMT group's products – Mr Melcher's 'heart' claim seems valid.□