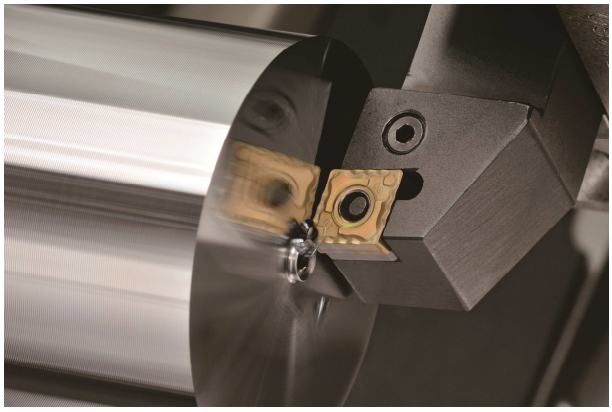
New-generation cermets featuring multiple tool lives



Due to the increasing diversity of tungsten carbides and high-performance coatings, the cermet cutting material has often been eclipsed during the last years. However, new-generation cermets from Sumitomo show considerably enhanced performance, significantly extended fields of application, and an extremely long service life of the cutting edges. Innovative coatings provide cermet cutting inserts with amazing properties and extremely long tool life.

By Karl-Heinz Gies, Stuttgart

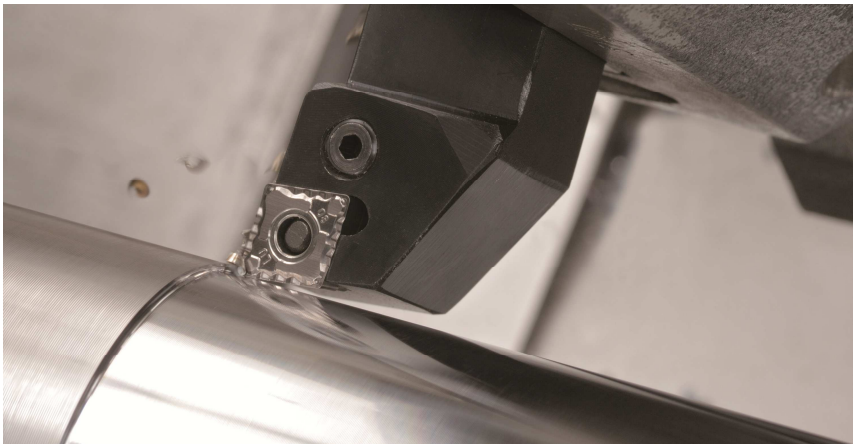
Many different types of tungsten carbide and equally different coatings for indexable cutting inserts offer a wide variety of machining options. It is this versatility and the supposedly easy deployment of such indexable inserts that constrained the market share of cermet inserts in the past. What is more, the cermet inserts are rumoured to show a certain sensitivity to fracture especially when it comes to interrupted cuts.

New types of cermets increase performance and extend the fields of application

However, the types of cermets have also undergone innovative developments that extended the fields of application and led to significant improvements. For many years, Sumitomo has been a market leader in the development of new cutting materials for cutting processes. The same applies to the cermets. The new types of cermets, T1000A and T1500A, succeeded in avoiding the initial disadvantages of cermets. One of Sumitomo's development objectives was to reduce the proportion of tungsten – a material difficult to procure – in the cermet compound of the cutting inserts. It was precisely this reduction in tungsten proportion that made the new types of cermets, T1000A and T1500A, show considerably less reaction with the steels to be machined compared to previous types of cermets. This results in considerably less welding with hardly any formation of built-up edges.

At the same time, the engineers at Sumitomo succeeded in optimising the composition of the cermets. Thanks to the increased incorporation of TiCN in the structure and the reduction of the tungsten proportion at the surface, the proportion of tough constitu-

ents in the compound was raised. This results in better resilience of the cutting inserts thus reducing the cutting edges' tendency to outbreaks. Optimisation of the sintering process at Sumitomo resulted in a tighter structure of the cermets. This way, the new types of cermets can stand higher cutting speeds and offer an extremely long tool life. Even machining soft steels or materials made of ferritic powder metals, typically showing a tendency to welding and built-up edges, can now be mastered without problems.



The machining of cutting edges was further optimised as well, which, in turn, leads to a hitherto unparalleled stability of the cutting edges. At the same time, this machining of cutting edges ensures the workpiece quality since the clean cut of the indexable inserts results in an almost glossy workpiece surface. And all that over the entire service life of the cermet inserts.

Hardness and toughness of the innovative cermet cutting materials T1000A and T1500A are different. This opens up different fields of application for the new cermets. The harder one, T1000A, is a P10 substrate and is recommended for cutting speeds from 150 m/min to 400 m/min. It is mainly used for continuous or slightly interrupted cut. The slightly tougher T1500A is a P20 substrate that is recommended as well for light interrupted cuts and cutting speeds from 60 to 200 m/min.

New coatings adapted to the cutting material

However, it is not only cermet substrates that have been further developed. Sumitomo can point out true innovations with coatings for the cermet inserts as well. To extend the universality of the cermet inserts, new coatings have been developed that significantly extend the fields of application for the substrates and further prolong their service life.

Under the designation T1500Z, Sumitomo offers a P20 cermet substrate with a coating named "Brilliant Coat" and protected under this designation that considerably improves the slipperiness on the surface of the inserts. During cutting, the chips at the surface slip better and the required cutting forces are further reduced. Hence, these indexable inserts are particularly suited for low-power machines and can be used both for continuous and interrupted cut. Thanks to the substrate and the specially adapted "Brilliant Coat" they are suited for the entire range of machining speeds from 60 to 350 m/min. The smooth gliding of the coated cutting edges leads to a steady cut avoiding the appearance of shutter marks and giving shiny surface structure in comparison to other tools.

The coated cermet substrate T3000Z has been specially developed for particularly high mechanical stress through interrupted cut. It is

an exceptionally durable coating capable of resisting highest mechanical stress. It is particularly recommended at cutting speeds from 1 to 200 m/min and frequently interrupted cut. Contrary to previous cermet coatings, the new coatings are precisely adapted to the types of substrate and are applied to the cutting inserts using special PVD processes. This results in an extremely good layer adhesion and the feared exfoliation of the coating is avoided. At the same time, the surface of the cutting insert is protected. This way, the coating also ensures a long service life of the new indexable inserts.

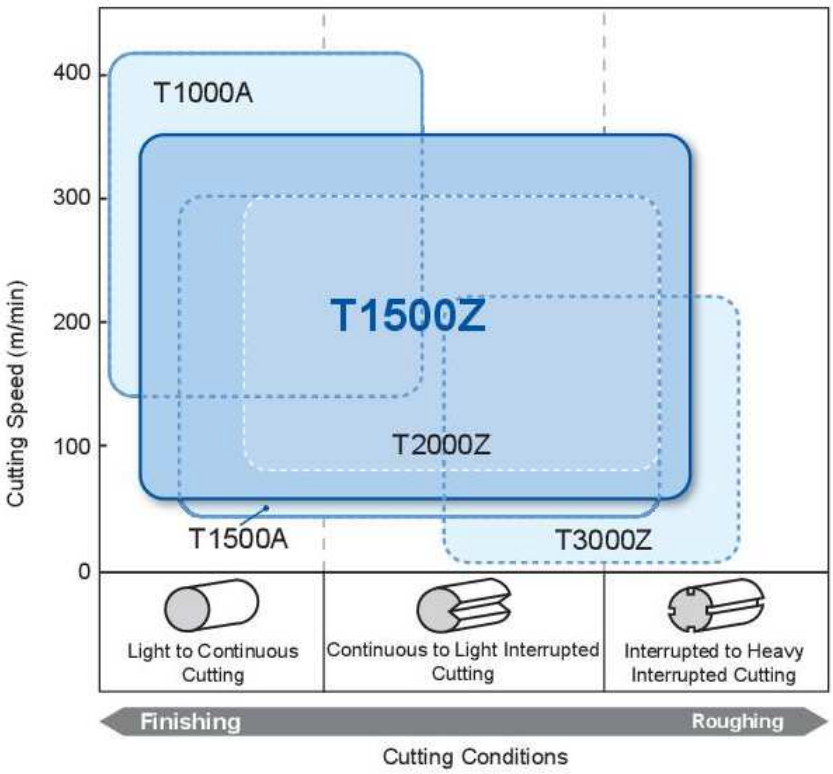
Durable alternative with sharp cutting edge

Compared to tungsten carbide indexable inserts, the cermet inserts have shown brilliant results in terms of tool life ever since in any field of application. But now even the workpieces are glossy thanks to the new substrates and coatings. The clean cut results in substantially improved workpiece surfaces everywhere, even with difficult materials. This is why these cutting inserts are mainly used for finishing.

Ever since, cermet inserts have featured comparatively sharp cutting edges. The new substrates and the refined manufacturing methods developed by Sumitomo now ensure that these cermet cutting edges are very robust and durable and, as a rule, achieve a considerably longer tool life than cutting edges made of tungsten carbide or those made from cermets from competitors. Particularly the machining of soft steels proves that these cutting inserts show only minor reaction with the material to be machined, and, contrary to previous cutting inserts, do not form built-up edges that account for high machining forces and early malfunction of the cutting edges. This is why the new cermet inserts from Sumitomo usually feature multiple tool life compared to previous cutting inserts or those offered by competitors.

All in all, it can be said that the innovative cermets from Sumitomo represent a true alternative to previously used cutting material. The strength of the new cutting materials becomes apparent especially when machining steels. They are harder than tungsten carbide inserts and feature sharp cutting edges that turned out to be extremely robust and durable in the meantime; this being the reason why these cutting inserts are particularly recommendable for series production. Here, they can fully make a feature of their long tool life.

Customers from energy engineering, medical engineering, vehicle construction, and general metal machining meanwhile confirmed the lab results obtained by the developers at Sumitomo. All of



them are glad about better surface qualities of their workpieces along with higher productivity and considerably reduced tool costs. When will you start your first attempt?

Stuttgart, November 2014
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