

TITANIUM DANCES TO A DIFFERENT BEAT

As part of a joint research project, the companies Blaser Swisslube and KAISER have searched for the optimum combination of tool and metalworking fluid for titanium cutting. The results are impressive.

All the lights go out. The race starts. Full throttle. When the 230 HP motor howls, the driver presses on the chunky tank to push the center of gravity forwards. After 2.6 seconds, the speed is 100 km/h. And after 5 seconds, the new Suter BMW is already thundering across the asphalt at 200 km/h. This driving performance is enough to make any Porsche driver turn pale and is only possible if both the driver and the motorcycle meet the highest requirements. While people train hard to reach this standard, the machine must have a particularly sophisticated execution.

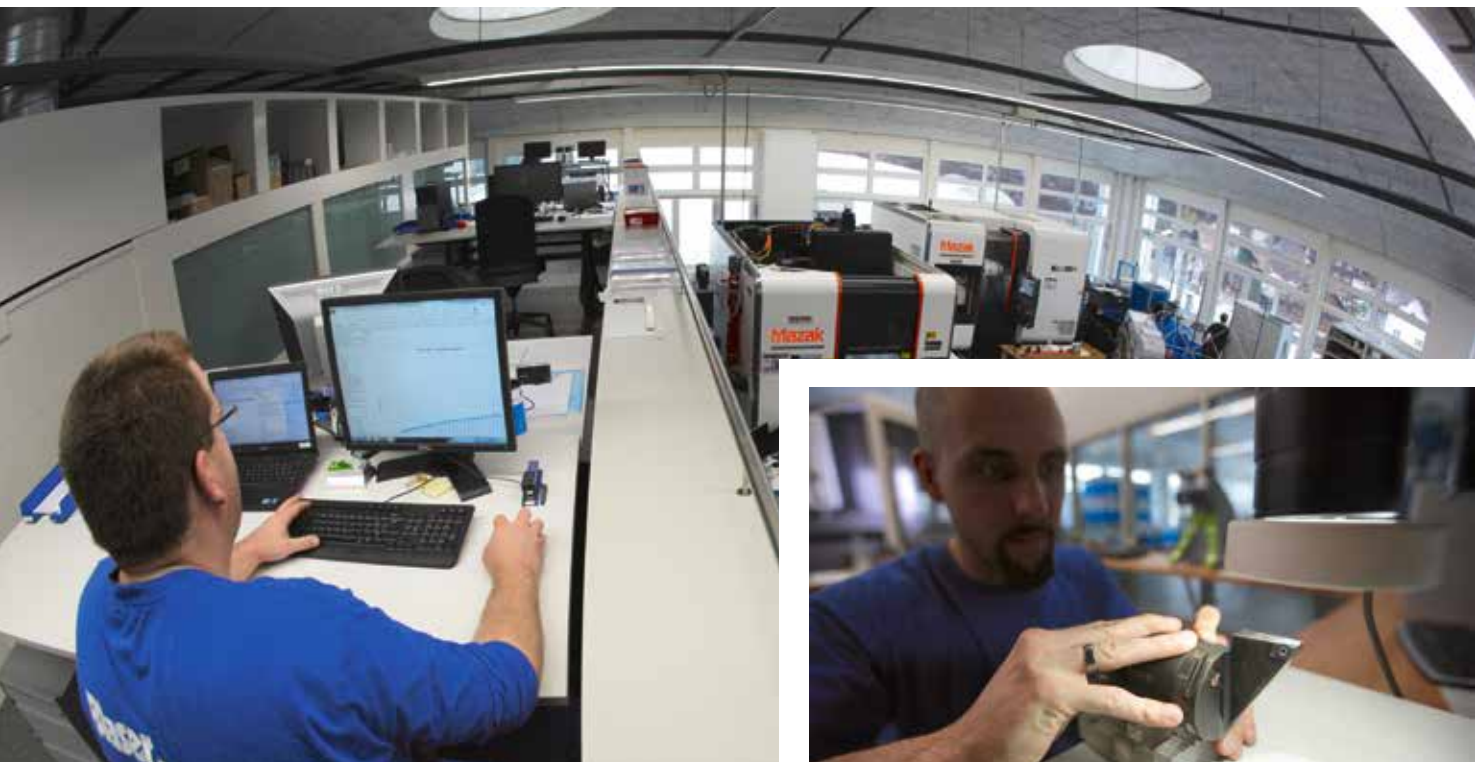
According to Roger Sutter, engineer at the Swiss racing motorcycle manufacturer Suter Racing, the challenge is in building a motorcycle with the right rigidity at a low weight. "For us, every gram counts", he says. To manage this balancing act, the use of titanium has been inevitable for motorcycle manufacturers. "The strength and light weight is perfect for us", says Sutter. However, the light metal is also hard to cut. "It is a real challenge to find the optimum components for working with titanium", he adds. Hansueli Looser, Director of Product Management at KAISER, takes the same line: "We receive more and more calls from customers complaining about the unacceptably low lifetime of tools used to work with titanium or inconel". The main

reason for this is the occurrence of vibrations. In fact it would be quite easy to change this, adds Looser. He is firmly convinced that the right combination of metalworking fluid and tool could result in a longer lifetime



Rear axle of the Moto3 motorcycle; titanium screws and turnbuckles

when working with titanium and thus lead to a corresponding reduction in time and tool deterioration. Specifically: Vibration-free tools are required. In combination with the optimum inserts, this enables the balanced



Practical testing on over 300 m²: the Blaser Technology Center in Hasle-Rüegsau

60 employees research Blaser metalworking fluids, five of them in the Technology Center

use of the insert resulting in reduced wear. This effect is reinforced with the right metalworking fluid which minimizes friction and provides the necessary cooling. Because little research and publicity has been carried out in this area up until now, the findings are not yet backed by industry as they would like.

In fact, a survey by the coolant manufacturer Blaser Swisslube shows that the choice of suitable tool and metalworking fluid only plays a minor role in the



l-r Hansueli Looser, Christoph Wüthrich, David Stucki



In total over 1 200 holes were measured and evaluated

purchase of a new machine. This is either because no consideration is given to the significant influence of the metalworking fluid and the cause-effect relationships with the materials and tools, or because their importance in the successful cutting process is underestimated. According to Christoph Wüthrich, Head of the Technology Center at Blaser Swisslube, metalworking fluid is only of modest importance in the industry. "On the quiet, they are often considered just a necessary evil."

UNIQUE TECHNOLOGY CENTER

To illustrate the importance of this necessary evil in the cutting process, Blaser has set up a Technology Center at their main site in Hasle-Rüegsau which is unique in this sector. At the 300m² site, customer cutting processes are optimized and their own products are tested. Wüthrich describes the latter as like "searching for a needle in a haystack" because a metalworking fluid consists of many different additives.

THE TESTS

Five approved metalworking fluids and several competing products were selected for the tests at KAISER. Over several months, Blaser and KAISER tested different inserts in combination with these different metalworking fluids.

What emerged was the realization that the selection of the right metalworking fluid has a significant influence on the lifetime of the insert. So, under favorable conditions, the lifetime of the same insert can increase 15-fold, depending on the metalworking fluid. As suspected, the choice of insert also plays a role. The lifetimes of the tested inserts differed by up to a factor of 20. The result is surprising as only inserts recommended by the manufacturers for cutting titanium were used in the tests. The results of the combination of the Blaser coolant B-Cool 755 and the insert 655.389 from KAISER were particularly impressive: This combination resulted in deterioration to the insert of just 0.002 mm. This was achieved after boring 81 holes with a depth of 51 mm and an average speed of 120 m/min, which is high for titanium.



The test tool precision boring head EWN 2-50XL

THE RESULTS

INFLUENCE OF CUTTING MATERIAL ON TOOL DETERIORATION

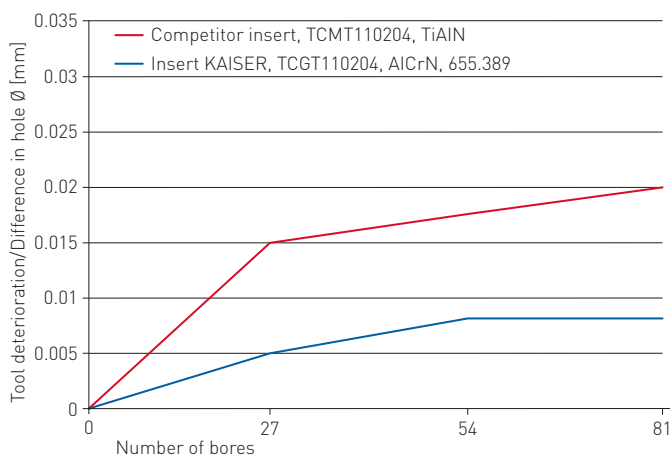
Different inserts in combination with Vasco 7000 with 8% concentration of Blaser.



Insert KAISER, TCGT110204, AlCrN, art. no. 655.389 (blue curve)



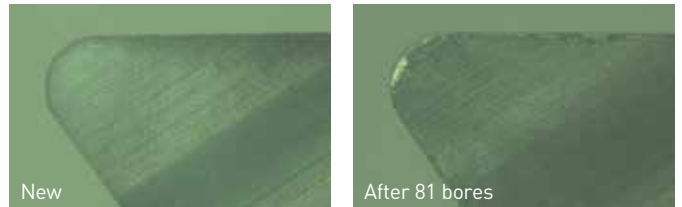
Competitor insert, TCMT110204, TiAlN (red curve)



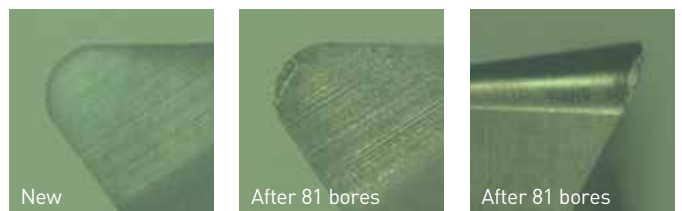
Metalworking fluid: Blaser Vasco 7000 8%
 Material: Titanium, Ti6Al4V, 3.7164
 Hole Ø: 21 - 26 mm
 Bore depth: 51 mm
 Vc: 120 m/min
 fn: 0.1 mm/U

INFLUENCE OF METALWORKING FLUID ON TOOL DETERIORATION

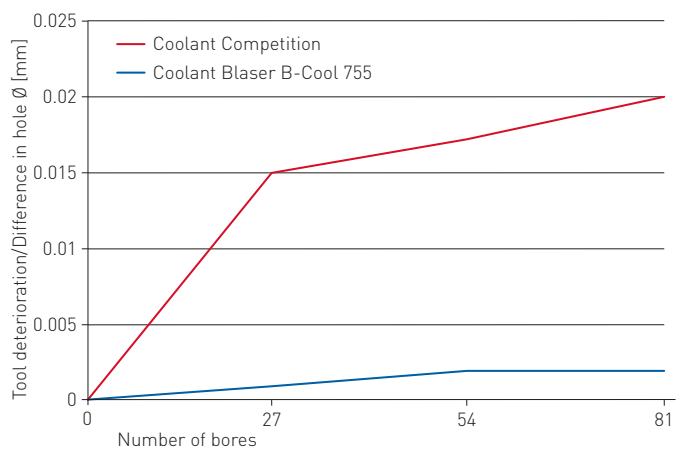
Different metalworking fluids with KAISER insert 655.389.



Coolant Blaser B-Cool (blue curve)



Coolant competition (red curve)



Insert: KAISER, TCGT110204, AlCrN, Art. Nr. 655.389
 Material: Titanium, Ti6Al4V, 3.7164
 Hole Ø: 21 - 26 mm
 Bore depth: 51 mm
 Vc: 120 m/min
 fn: 0.1 mm/U

SHORT AND SWEET

- The metalworking fluid has a significant influence on the lifetime of the insert. Depending on the product, the lifetime of the insert can increase 15-fold.
- With regard to the inserts, there are dramatic differences in terms of the lifetime: In spite of the same metalworking fluid and exactly the same cutting parameter, this increases 20-fold.
- The best combination for boring titanium: KAISER 655.389 insert in combination with the metalworking fluid B-Cool 755 from Blaser Swisslube.

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