PRESS RELEASE

Date: 01.06.2018

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With MAPAL for a chatterfree process

During machining, vibrations often occur that are either stimulated externally or caused by the machining process itself. The self-excited chattering vibrations have a negative impact on the machining result and significantly reduce the service life of the tools. In addition the tool machine is subjected to high loads by the chattering. MAPAL has therefore developed different tool concepts that counteract the chattering vibrations.

Various tool concepts reduce vibrations during machining and ensure a smooth, reliable process.

Poor circularities and cylindrical forms, inadequate surface finishes and, in extreme cases, broken tools and inserts – the consequences of bending or torsion vibrations on the tool can vary during machining. Because vibrations lead to socalled chattering.

Causes of chatter vibrations

The chattering vibrations come from a dynamic instability of the machining process. This can
have different causes. For example, an incorrectly clamped tool or inadequately fixed clamping can cause chattering. The same applies for long, narrow tools with correspondingly low bending resistance. If too much force acts on them due to excessive cutting speeds for example, chattering vibrations are the result. When machining very hard materials, increased vibrations occur compared with softer materials. Tool clamping also significantly affects the stability of the system. In addition high cutting depths and interrupted cuts also act as excitation of vibration. The ratio of the excitation and movement describes the stability of the process.

The precision tool manufacturer MAPAL has intensively looked into the causes for chattering vibrations. They can be prevented or compensated by different

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approaches. For example, one way is to reduce the load and dynamics of the system – as a result of adapted cutting speeds or the optimum relationship between the speed and feed. A second approach that is decisive for the tool manufacturer is, to design the tools themselves more stably, thereby reducing the acting forces and stabilising the machining process using special tool geometries.

Countersink with reduced axial forces for stable countersinking

Chatter marks often occur at countersinks. Countersinks are usually manufactured using hand
drills or cordless drills. These machine conditions inevitably give rise to instability of the entire system. It was therefore important when developing a new countersink for it to stabilise itself. MAPAL has developed a new generation of countersinks with significantly reduced axial forces for this use. The force reduced by 50 percent results from the significantly unequal spacing of the three cutting edges. The Y-cutting edge arrangement also leads to an even, defined applied force and prevents the cutting edges jamming. The result is significantly fewer vibrations on the tool which can be noticed by higher accuracies, better surface finishes and longer tool lives.

ARC shaped land for best support

During boring processes, particularly with higher stock removal, radial vibrations often arise that cause chattering. The unequal spacing alone is not enough for high stock removal. For this reason MAPAL has fitted its tangential roughing tools (TSW) for this type of machining with innovative, six cutting edge indexable inserts with a special arc shaped land. This special geometry is a support surface on the insert that supports the tool in the bore and is comparable to an arc land chamfer on fixed reamers. The unequal spacing as well as the arc shaped land reliably prevents chattering and vibration for these tools.

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Welded construction for dynamic lightness

Particularly for large, heavy tools with long projection, pendulum oscillations occur that must
be absorbed or compensated. Otherwise work must be performed with such low cutting speeds
that the process is not economical. For this case, MAPAL has developed the so-called “welded construction”. A thin-walled tube serves as a tool body, making the tool extremely light but also
very stable and rigid – “dynamically light”. The carriers for the inserts and guide pads are welded on and supported one another by means of connecting ribs. To optimise the relationship of rigidity and weight and to counteract the pendulum oscillations, for this type of tool MAPAL simulates the machining forces as well as the stresses that arise, bending vibrations and torsion vibrations by means of FEM (Finite Element Method). All in all the risk of chattering is minimised and the support and therefore the stability of the entire system is also ensured for an interrupted cut.

Absorder system for vibration damping in the shaft

Tools for boring and milling with very long projection often cause insufficient dynamic rigidity of the system and are more inclined to vibrate. To compensate this vibration, MAPAL has developed an innovative system for vibration damping directly in the tool shaft. An absorber system consisting of several spring packs compensates the frequency of the vibration in the opposite direction. In this way only minimum vibrations are transferred to the tool body – they are smaller by a factor of 1,000 when compared to a setup without an absorber system. Despite the longer projection, operation is smoother and more stable even at higher cutting values.

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Captions:

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The clear unequal spacing of the three cutting edges reduces the axial forces during countersinking by 50 per cent.

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Unequal spacing and arc shaped land reliably prevent chatter and vibration.

An absorber system integrated in the shaft of the arbor shanks reduces vibrations by a factor of 1,000.

If published, please send a voucher copy
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