Here, we introduce the knowledge and various knowledge about the product TAKAMAZ a variety of machine tools. I hope you will help the daily work of customers.

The 13th Improved Chip Processing with a Unique Boring Bar

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In boring cut, poor chip ejection results to abnormal insert damage, poor dimensional accuracy and surface roughness due to chip jamming. We will now introduce to you a cutting example using a unique boring bar with chip removal.

Summary

With cutting materials where chip processing is problematic such as cold-forged items (un-annealed), it is thought that boring bars with extremely thick shank diameters are to be used to suppress waviness during deep bore cutting process. However, the gap between the cutting diameter and the boring bar becomes smaller, eliminating the discharge space for the chips generated. This leads to problems such as abnormal insert damage and poor roughness, etc., due to chip jamming. For this reason, measures have been taken through machining methods such as step operations for purposes of chip breakage, but these increase the cutting times, and degrade cutting efficiency. Although countermeasures such as chip breakers are adopted in chip processing, chip breaking is not easy unless the machined material is characterized by being extremely soft, and simply changing the inserts has not been a permanent solution.

Evaluation Content

By partially cutting of the end top face of a boring bar, we made a unique shaped boring bar that allows chips to flow forward. We then made a comparison with conventional boring bar. The Unique Boring Bar currently used was made so as not to lose rigidity, the shank is ultra-hard, and the end is made of steel. (Brazed) The cutting piece and the cutting locations are shown in Figure 1. The tools and cutting conditions used are shown in Table 1, and the details of the tool shape, etc., are shown in the figure annexed to Table 1.

Evaluation Result

Figure 2 shows Evaluation Result.
You must pay attention to the content shown in Table 2 in boring work with difficult chip processing, such as for cold-forged items.

Figure 1.

Material	SCM415
Formed Material	Cold-forged Material *No hot rolling
Pre-Cutting Heat Treatment	None
Cutting Purpose	Trial, Test

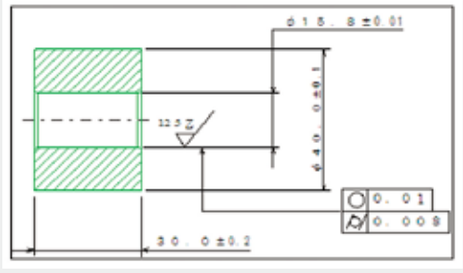
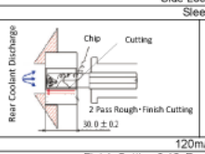
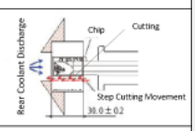
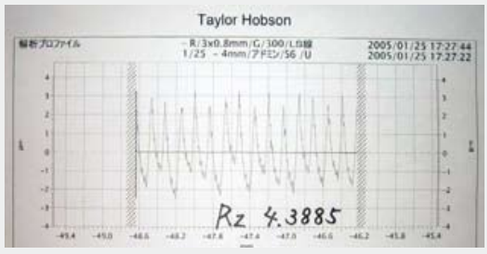
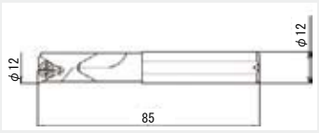


Figure 2.

Tool Used	Special Carbide Boring Holder		Carbide Boring Holder C12M-STUPR11-14
Tool Length	36mm		
Chip Used	TPMT110308N-LU/T3000Z(Coated Cermet)		
Machine Used	CNC Lathe		
Tool Types	Indexable Boring Holder		
Size	φ 12×85		φ 12×150
Manufacturer	Sumitomo Electric Hardmetal Co.		
Material	Carbide Shank		
Part Name	LU Breaker		
Tool Mounting Method	Side Lock Type		
(Tool holder)	Sleeve		
Cutting Condition	Material SCM415, Cold-forged Material *No hot rolling		
	Cutting Speed	120m/min	
	Feed per Revolution	Finish Cutting 0.16, Rough Cutting 0.2mm/rev	
	Cutting	Rough Cutting 0.8mm, Finish Cutting0.1mm	
	Cutting Oil	Water Soluble Cutting Oil (Emulsion)	
Result	Abnormal insert damage due to chip jamming disappeared, and this was connected to stabilization of cut surface roughness and dimensional accuracy. In addition, it was possible to eliminate the step operation cutting of the conventional work methods, shortening the cutting times, and raising cutting efficiency (see the photos below)		Abnormal insert damage occurs due to chip jamming, degrading the cut surface roughness. Step cut operations have often been used to break and eliminate the chips. For this reason, cutting times were greatly increased, and the cutting efficiency was extremely low.



Appended figure2



Chip Ejection Shaped Unique Boring Bar

Conventional Standard Carbide Boring Bar

Summary

By using a unique boring bar that allows chip ejection, abnormal insert damage due to chip jamming disappears during boring cut, and this results to the stabilization of the dimensional accuracy and surface roughness. In addition, the step cut for chip breaking of the conventional methods becomes unnecessary, shortening cutting times, and raising the cutting efficiency.
Please take note of the content shown in Table 1 in boring cut with difficult chip processing, such as for cold-forged items.

Table 1

①	During cutting, as much as possible, cutting oil should be discharged at sufficient pressure from inside the shaft ejecting the chips at the front side.
②	The protruding amount of the bar must have some allowance so that the chips eject in the forward direction. (To a degree that does not lose its rigidity)
③	During insert selection, select one with good chip processing properties, and set suitable cutting conditions while observing the machining chip state.
④	If a chip-ejecting shape is adopted, an extremely-thick shank diameter and ultra-hard shank is needed so as not to lose rigidity.
⑤	There is also a method where the chip ejection direction forcibly ejects to the inside rather than to the front as in the present example. This option must be selected according to the cutting environment and conditions.