
Optimizing a Tool for High Performance General Machining



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Optimizing a tool for high performance general machining

Given the growing presence of low cost suppliers around the globe, manufacturers must have the ability to act faster, reduce lead times, and cut costs in order to survive. This drives them to continually look for faster, cheaper and more reliable products to suit their specific needs and provide a viable competitive edge. For companies that specialize in producing specific materials and components with planned production runs, they can boost their productivity by choosing dedicated tools to meet their particular machining demands. However, for the shops that manufacture a wide range of components in a variety of materials, it can be a challenge to find an effective and economical cutter that can optimize the differing operations. These shops often stock a multitude of tools to address each situation, adding to inventory and tool changeover time. Or, they may sacrifice a bit in the cutting data by going with a multi-purpose tool in order to save time, eliminate tool changes and to simplify inventory. Finding the right cutting solution – one that is both versatile and productive --- can be difficult.

Optimizing a cutter across all materials

Finding the right balance of properties and design needed to cut a wide range of materials requires looking at the machinability characteristics of each differing material and the function required by the tool in order to perform adequately on each of them. The three main areas of the tool that can be influenced to affect performance include the substrate, coating and geometry.

By studying these attributes and experimenting with different combinations and taking what it has learned from critical industries, Seco has engineered a critical tool that can address these areas that would prior have been niche applications. This new cutter, the Jabro-Solid² (Solid Square), is

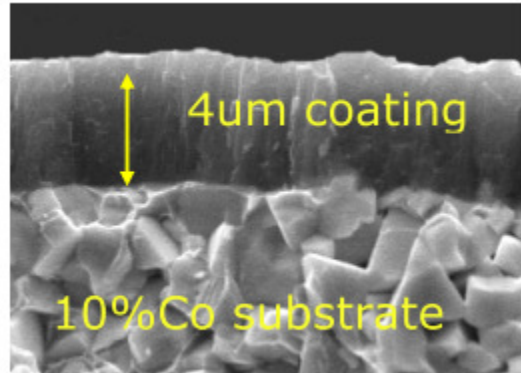


optimized specifically for small diameter general machining applications across a range of industries including mold & die, medical, gun making, power generation, aerospace, and more. This new family solid carbide end mills is totally versatile and easy to use, offering complete flexibility and performance in all materials from carbon steels through grey cast iron to stainless steels and superalloys.

For dimensional stability, rigidity and toughness, the new cutter features a balanced XMG substrate which is a 10%Co substrate with <math><1\mu\text{m}</math> grain size. The carbide combines wear and fracture resistance with deformation resistance. Hardness is required in order to increase the wear resistance and the resistance to deformation.

The quality & effectiveness of the coating is determined by its ability to resist (withstand and/or slow down) the rate of wear across the rake and clearance faces during the cutting process. The polished SIRON-A finish of the Jabro-Solid² is an AlCrN (aluminum chromium nitride) coating, which has excellent chemical stability at fluctuating temperatures up to 1100°C with no oxidation

or reaction to the material being cut. This provides additional wear resistance with no loss in edge strength. The smooth surface enables the chip to flow freely over the cutting rake face, reducing friction and heat build-up. This ensures that the heat is dissipated in the chip to increase tool life in both wet and dry conditions.

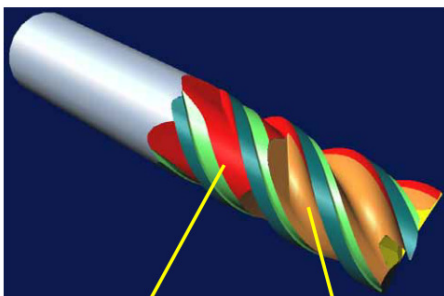


By adding an edge preparation (fine honing of the cutting edge) prior to coating, the cutting edge is further strengthened to improve the coating adhesion as the internal stresses in the coating are reduced. The major benefit to the customer is the significant increase in the tool life. In lab tests, Seco achieved up to double the tool life as compared to coated tools running under the same conditions.

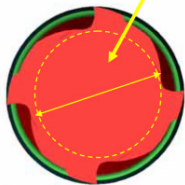
User's Choice

The new tool is available in two geometries, both which provide the cutting or shearing action that determines the chip form and flow of the chip away from the cutting zone. The JS510 series has a high helix and is available in 2, 3 and 4-flute end mills for axial cutting depths up to 5xD. It features an increased core diameter for added stability.

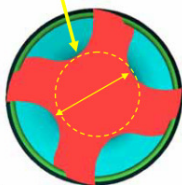
The JS550 series additionally features a differential tooth pitch (or staggered spacing between each tooth). This interferes with the regenerative vibration that creates tool chatter enabling an



increase in productivity by running at higher spindle speeds together with increased depths of cut to create an out-of-phase cutting action. This results in a dampening of the harmonics to practically eliminate vibration for chatter free milling, reduced scrap and superior surface finishes.



Added stability allows heavier cuts & reduces tool deflection



Increase flute cavity gives excellent chip evacuation.

Also, the double core of the JS550 combines strength and rigidity while providing excellent chip evacuation. This enables full slotting operations with a four-flute cutter without the flutes clogging or jamming with swarf.

Productivity impact

People often think of a general purpose tool as a commodity item. There are a lot of tooling choices out there that can be used in a variety of applications. However, the Jabro-Solid² should be thought of as a specialized solution for general machining. Users get optimized high performing features in a general purpose tool, where previously they would have applied a more costly niche solution. This delivers higher cutting data across all materials to result in cost savings on multiple fronts.

In tests against competitive tools, Jabro-Solid² has illustrated a 30-70% increase in tool life. This increase in tool life means less cutters are required, thus reducing the tool costs per part.

However, the savings are further increased as the customer requires fewer tools and there is less machine downtime for tool changes. If you assume that machining time costs \$100/hour and the customer has to produce 1000 parts, we can set up a potential savings scenario:

	Existing Tools	Jabro-Solid ²	Change
Tool Purchase Price	\$80	\$64	-20%
Pieces produced per tool	10	15	+50%
Tool cost per part	\$8	\$4.26	-47%
Tool change cost *assuming 1 minute/tool change	\$197	\$120	-39%
Cost per batch	\$6,162	\$3,306	46% savings

In this illustration, it becomes clear that a high performing general purpose tool such as the Jabro-Solid can make a significant impact on a machining shop's productivity, and thus cost.

For the first time, a solution has been developed that goes against traditional wisdom -- general machining does not equal commodity. The Jabro-Solid² is a very sophisticated base tool that allows users to accomplish high productivity across materials where they would previously have had to specify and order a custom tool to meet their targets. Users can now easily implement a high productivity machining strategy in general machining operations for better performance and reduced cost.