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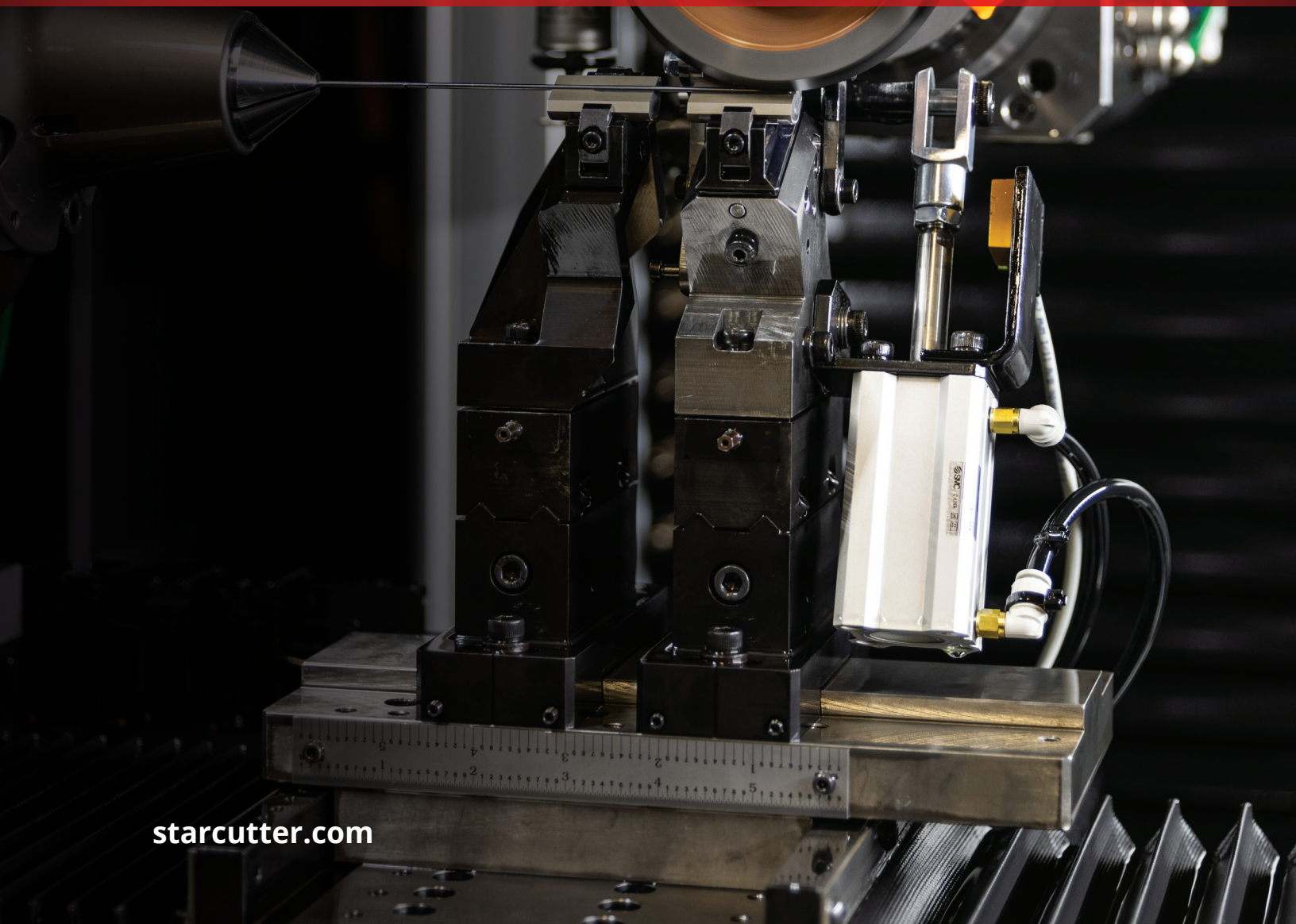
Optimizing Your Tool Grinding Supply Chain



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Machining Parts, Grinding Tools

Grinding is one of those operations that has a broad range of applications. It can span the entire spectrum from full on metal removal all the way to just final surface finishing and is a must across many industries to achieve the final part spec and tolerance. Prior to grinding, part manufacturing is accomplished in other ways, including good old fashion machining. That can be done from the solid, near net shapes (castings) or, more recently, via 3D printing.

Tool making is very different because the 'workpiece' is typically made from either solid carbide or high-speed steel, so material removal must be done via grinding. The focus is on shaping and sharpening to create specific preparations and geometries for an intended application and industry. For the purpose of this discussion, we will focus on the grinding of carbide tooling.

The process for creating a round tool, for example, begins with a carbide rod or blank and ends as a finished and polished tool. Along the way, the blank is prepped and precisely altered by grinding in reliefs, chamfers, whistle notches, and many other complex geometries. The prepped blank then goes to finishing for fluting, gashing, pointing, and drill points – all to ensure exacting cutting performance for the end user.

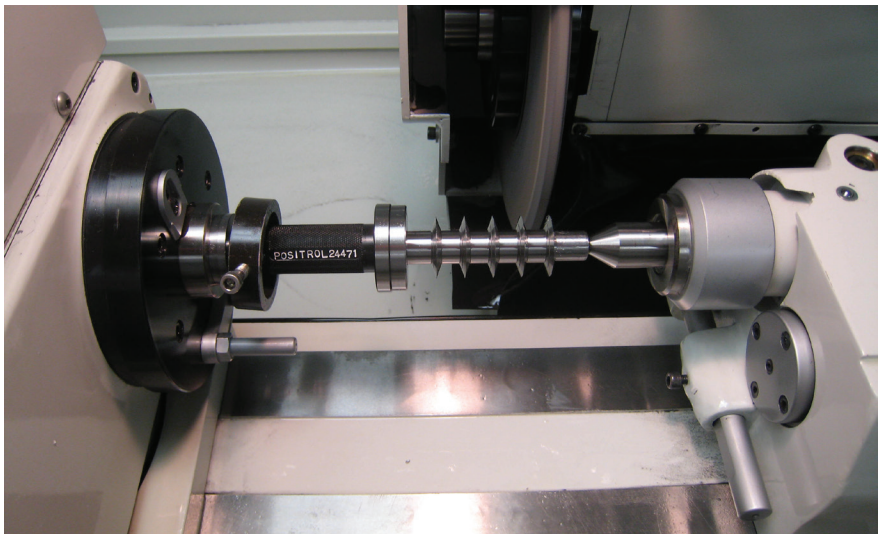
In total, tool grinding requires expertise in machine technology, programming, process, and material. Typically, this has been done by relying on multiple providers in the supply chain – but that can lead to gaps in overall efficiency. **So, why not consolidate?**

Round tools begin life as a carbide rod or preformed blank.

Setting Up to Make Your Run

Grinder Choice: A logical place to start in your tool making considerations is the machine needed for the job. The CNC grinder choices most often used for tool manufacture include Cylindrical, Centerless and, of course, dedicated Tool and Cutter Grinders.

Cylindrical grinders rotate the workpiece between two centers along its axis to provide tight tolerance grinding of the outside diameter of a variety of shapes and sizes.

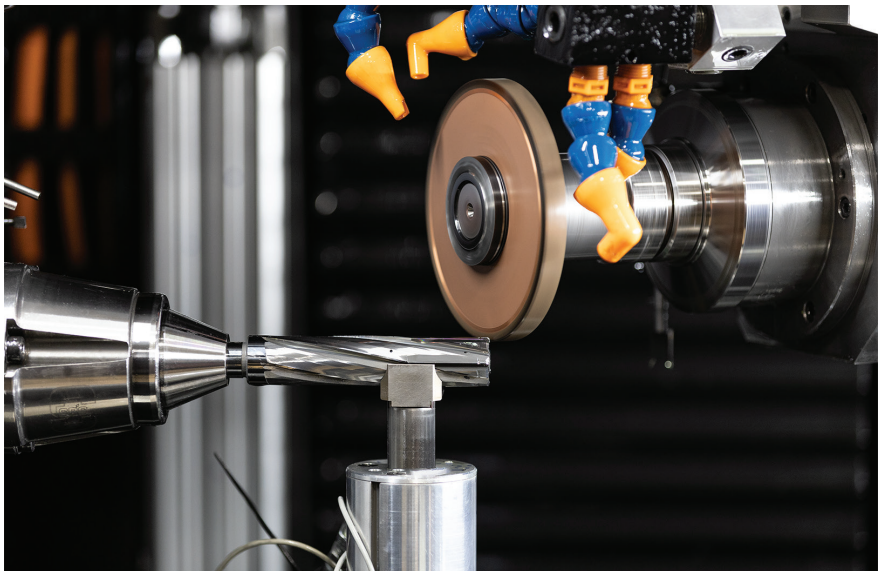


Cylindrical grinding features a rotating grinding wheel and workpiece fixtured around a central axis of rotation.

Centerless grinding positions the workpiece along its axial length, positioned between an abrasive wheel and an extra regulating wheel mechanism rather than a spindle or fixture so no center of axis is needed to perform the operations.

Centerless grinding works with the part being fixtured only on one end while the grinding wheel, or wheels rotate relative to one another to remove material.

Tool and cutter grinders take operations to the next level with the ability to machine complex angles, support automation and the use of multiple grinding wheels, all in a single setup. These five axis CNC machines are well suited for end mills, drills and reamers, as well as enabling the creation of custom tools tailored to specific applications. The advanced capability can also require higher levels of skill – from both the operator and the programmer.

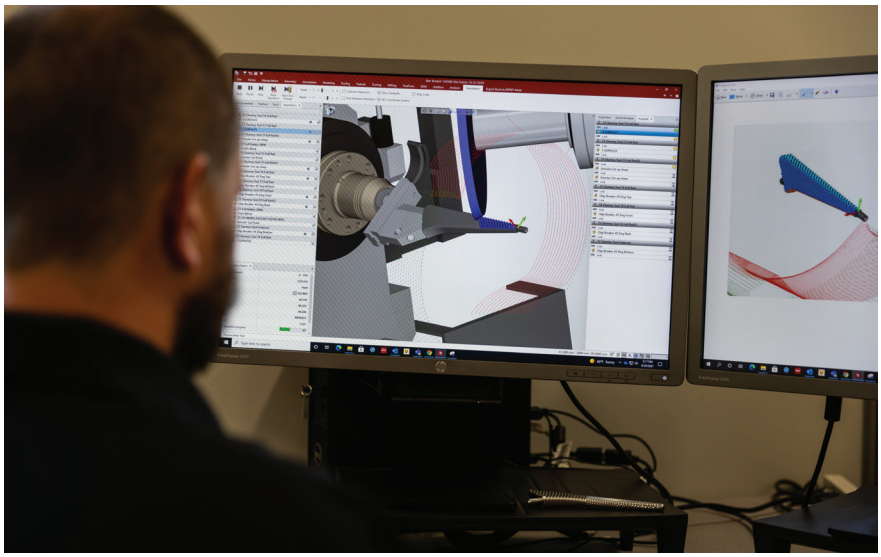


Tool grinders leverage full five-axis, CNC capability to impart exact geometrical shapes and tolerances.

Software: Choosing from today's software are platforms is a second key consideration.

Software is used to program the specific parameters of each tool, such as the desired shape, dimensions and cutting angles. It enables operators to create custom tool designs or select from a library of pre-existing templates. Additionally, advanced software provides functions such as 3D simulation, optimizing cutting paths and speeds prior to production, helping to build accuracy and efficiency into the operation.

In today's market, there are several commonly used and industry standard software choices, which can vary from extremely simple setup – such as TRU TECH's intuitive Pick-N-Place™ software appropriate for blank prep – to more sophisticated offerings. NUMROTO and ESPRIT, for example, are often grinding machines, are both focused on simplifying the complexities of tool manufacture while excelling in specials and complicated tool forms.



For 5-axis grinding, software solutions such as ESPRIT offer digital simulation capabilities and edit-free G-code that helps eliminate programming errors and speed time to production.

Regardless of the choice, operators and programmers are seeking solutions that support things like simplified setup, quick changeover (especially for high mix low volume applications), and regular version upgrades to keep pace with ever evolving technology advancements.

Skilled Labor: The third top consideration in the setup phase is appropriate level of skill and experience from the folks who make it happen. There are many individuals throughout industry with the capability and artistry to get the most out of these machines and software systems. However, in cases where that experience level is not there – due to things like the fast pace of technological advancements or a younger workforce – manufacturers need to rely on their suppliers for application support. Value-added services such as process development and even prototyping can set the customer on the right path right out of the gate. And, as mentioned above, ease of use and simplified machine setup is all a consideration in today's market where finding skilled labor is a challenge.

Given challenges in finding skilled labor, intuitive machine programming can play an important role in a grinding machine purchase.

A Material World

With the choice of machine and software in hand, and a robust supplier to support the application, it's time to choose your tool makeup.

Carbide Pre-forms: Manufacturers can buy carbide forms that already have the desired features and then do the five-axis finishing on-site. Preform blanks come to the customer in "near net shape" leaving only minimum amount of grind stock left to create a finished tool.

Pre-form blanks arrive in near-net shape, only requiring finish grinding operations.

The two largest benefits of this approach are reduced cycle time, as it takes significantly less time to grind from a preform, and less wear and tear on expensive five-axis machines. Less heavy fluting and material removal in the final operations are easier on the machine. Two drawbacks to the preform route are increased cost and, more notably, lead time. Manufacturers are wise to add at least two weeks to their delivery schedule.

Carbide Blanks: The other way to go is from carbide rod or blank and do the whole process internally. This is a more common procedure with many manufacturers. Going this route requires a blank prep machine and process to cut all the features while another grinder is required to do the finishing.

The initial upfront investment in this approach may be more, but it can pay off in providing overall control of the process from A through Z, helping to improve quality, delivery times and cost. Another consideration of this approach is that blank prep machines take a long time to setup and program, so this could be a drawback for companies doing low-volume, high-mix applications. This is where it can be beneficial to use a grinder with simplified software and setup, enabling quick changeover.

Machines such as the TRU TECH T93 can simplify blank prep setup, making it easy to change from job to job.

Manufacturing from the blank can be the way to go. With the availability of carbide rods in varying lengths and diameters and a manufacturer with the machines, software, programming, application expertise and processes in place, tool makers can have a lot of success. However, that can be a tall order as all the supply chain pieces and infrastructure need to fit together to properly control the process.

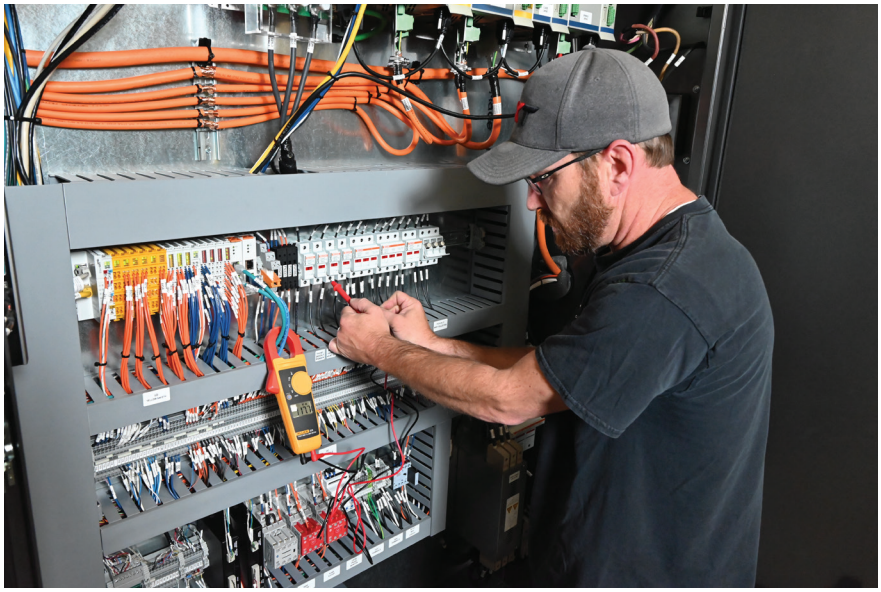
So, where does one turn to?

Proximity Matters

An often overlooked consideration in tool and machine purchasing is the post-sales support. After the supply chain disruptions that occurred during and post-Covid, more companies are looking to near-shoring or reshoring back to the U.S. to strengthen their supply chain.

Having a US-based machine tool supplier can lead to shorter lead times, faster response rates and better overall communication. This proximity allows for more frequent site visits and easier collaboration on custom solutions to meet specific production needs.

> **"…. US companies and consumers are starting to truly 'buy American', as shown by our US self-sufficiency index (SSI), which tracks how what's made in the United States for the US market compares against what's imported and stays in the US market."**
>
> *—Patrick Van den Bossche, Kearney Research*



Skilled service personnel work on the machine and behind it to keep productivity at a maximum.

Additionally, working with a domestic supplier helps reduce the risk of disruptions due to international shipping delays or political instability. With expertise in the local market and understanding of industry regulations, a US-based machine tool supplier can provide valuable insights and support throughout the entire manufacturing process. Overall, integrating a US-based machine tool supplier into your supply chain strategy can greatly enhance productivity and competitiveness in today's global marketplace.

Single Source Supplier

There are a lot of moving parts and options in tool grinding; each having an impact on one another. Just as supplier location can benefit an operation, so can reducing the number of suppliers. Having to rely on multiple suppliers for equipment, software, and material, not to mention for application and process support, can leave the door open for shipment delays, quality variances and process inconsistencies to name a few.

Pulling it all together to streamline the supply chain through a single integrated partner is one way to smooth out the operations, speed up the process and increase output.

By working with one supplier for all their machine tool needs, companies can streamline their procurement processes and reduce administrative burden. This allows more time to focus on core business activities and increase overall efficiency. Companies can also benefit from having consistent quality standards across all equipment, ensuring compatibility and minimizing downtime due to maintenance or repairs. Overall, partnering with a single-source machine-tool supplier can result in improved productivity, cost savings and enhanced operational performance for businesses in the manufacturing sector.

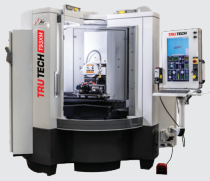
Reach out to a Star Cutter tooling solution expert, call (248) 474-8200 or email sales@starcutter.com

Star Cutter offers turnkey grinding solutions for tool manufacturing, supporting your manufacturing with a consultative sales approach, process development and post-sales service to ensure the highest quality and productivity in your business.

CENTERLESS – TRU TECH

TT8400

T93XM



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