

# Live Tooling: Basic Concepts, Recent Developments

**LIVE TOOLING, AS THE NAME IMPLIES**, is driven by the CNC and the turrets of various spindle and powered sub-spindle configurations on CNC lathes. It performs various operations while the workpiece remains in orientation to the main spindle. These devices, whether BMT or VDI, are also known as driven tools, as opposed to the static tools used during turning. They are usually customized for a particular machine tool builder's turret assembly.

Most often, live tooling is offered in standard straight and 90° configurations with a variety of tool output clamping systems, including collet chuck, arbor, Weldon, Capto, whistle notch, hydraulic, HSK, CAT, ABS and custom or proprietary systems.

For many shops, jobs frequently change, part volumes increase, and challenges occur in machining large parts with deep pockets or small, intricate parts. In these situations, shops may need new machinery, but they often make a mistake by simply accepting standard tooling packages provided by the builder.

This is definitely not a criticism of the standard packages from builders. Instead, this article focuses on providing a set of parameters to consider when evaluating the tooling and tool-holding devices to use in your shop or production department. Simply stated, when determining the proper tooling to be used, a shop needs to do as much evaluation of its processes as it did when evaluating various machine tools for purchase.

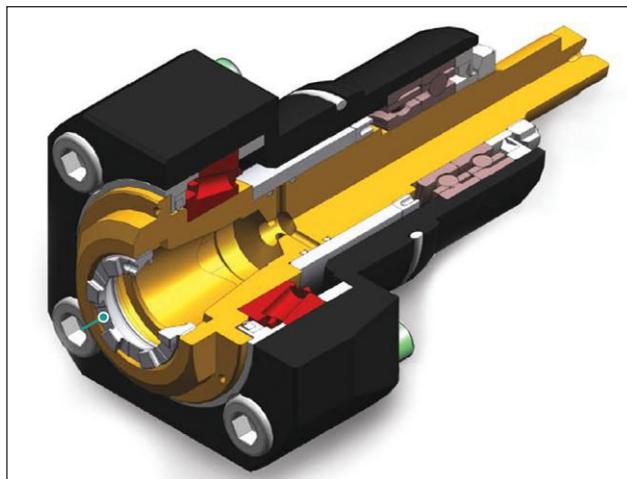
This examination can range from the simple (external vs. internal coolant) to the sublime (adjustable or extended tooling configurations) to the truly exotic, an example of which is provided at the end of this article.

Tool life is the product of cutting intensity, materials processed, machine stability and, of

course, piece parts produced. Two seemingly identical job shops can have vastly different tooling needs because one is focused on automotive and the other is medical. Other differences



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**Combination spindle and roller bearings are best for tool rigidity on axial tools, while roller bearings improve radial tool performance. (All images provided by Platinum Tooling)**

arise when one shop specializes in one-offs and low-volume work and another on longer-run jobs.

The totality of the machining operation determines the best tooling for specific machines. Bearing construction and the resulting spindle concentricity drive the life of any tool and shops might find that just a 10-15 percent higher investment in a better design can yield both longer lasting cutters and consistently superior finish.

The stability and rigidity of the machine tool base are also critical factors, especially on large or deep-pocket workpieces, where the distance from the tool base to the cutter tip is greater. Bevel and spur gears that are hardened, ground and lapped in sets are best for smooth transition and minimal runout. Roller bearings are consistently superior to spindle bearings in live tooling applications, so look for a combination system to get the highest precision possible. Also look for an internal vs. external collet nut so the tool seats more deeply in the tool, as superior rigidity will result.

Likewise, high-pressure coolant might be desirable. Look for 2,000 psi (13.8 MPa) in 90° tools and 1,000 psi (6.9 MPa) minimum in straight tools.

### Enough Speed for the Need?

Another question is if the machine's turret rpm is sufficient to handle the work to be done. It's possible a speed increaser on the tool would be helpful.

Would it be beneficial to move secondary operations to a lathe? With this option, gear hobbing could be performed, or a shop could produce squares or flats via polygon machining.

Standard live tooling most often is best suited to production work, where finish, tolerances and cutter life are critical, while quick-change systems may be better suited to a shop that produces families of products and other instances where offline tool presetting is used.

This opens the discussion of long-term flexibility, which is the most often overlooked consideration when buying live tooling. What work a shop has, what work will be coming in the future, and the overall economies of a changeable adapter system on tooling may all be factors not typically considered when the focus is only on the machine being purchased. Dedicated tools for large product families may be desirable, but shops should consider a changeable adapter system and talk to the supplier before making that determination. Likewise, if anticipated future work involves additional product families, think ahead when buying the initial tooling for the machine.



**An internal clamping nut seats the tool more deeply.**



**An example of a very large, deep-pocket tool that initially seemed too expensive until the tests proved otherwise.**

If standard ER tooling is suitable for the work, there are many good suppliers, but consider the construction aspects noted above. There are fewer suppliers of quick-change or changeable adapter systems, so seek them out and be sure they can supply the product styles needed for all your lathe brands. Adjustable angle-head systems can be costly but worthwhile—due to their stability and rigid construction—when producing part families with only slight dimensional differences.

### Big Paybacks Possible

Now, here's one of the exotic examples promised earlier. This example illustrates the value of having test runs done on alternative tool styles.

One company was cross-milling an AL6063 sheave, using an ER 40 output tool on a Eurotech lathe and running 10 ipm at 4,000 rpm. It was making three passes with a cycle time of 262 seconds and getting a chatter finish on 20,000 pieces per year. Annual machining cost was more than \$130,000.

By using an improved adapter tool design with ER32AX output and the same parameters, the company produced the part in a single pass with a smooth finish and cycle time of 172 seconds. This amounted to an annual savings of \$45,000, approximately 20 times the cost of the tool.

In the end, you may not need a +135°/-30° universal adjustable tool or a multi-spindle live holder or even a quick-change adapter system, but consider all the options. Talk to your machine builder and several tool suppliers, as well as the most important people in this equation—your shop personnel. ↪

*Editor's note: The author welcomes questions, comments and input. Contact Preben Hansen at 847-749-0633 or email him at [phansen@platinumtooling.com](mailto:phansen@platinumtooling.com)*