



Optimize

## Tooling Costs: Time to Move Past Purchase Price

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### What You Need to Know:

The characteristics of the tooling selected determine the quality and precision of the finished part, as well as the speed and repeatability of production. Higher performance tooling can be used to help boost output.

By allowing more parts to be machined per hour or per shift, a high-performance cutting tool reduces the impact of both of these big contributors to part cost.

Most production managers understand what it is that drives direct labor and materials costs, but they are much less aware of what drives overhead costs.

Some hidden costs can be minimized through the initial selection of both machine and tooling, which are intimately related and ideally should be considered together before purchase.

Take a look at what's uncovered when tooling is viewed as an essential output asset rather than an overhead cost to be slashed. Selecting the right tool that offers the most productive bang for the proverbial manufacturing buck might be the way to go.

The pressure to cut costs in machine tooling is enormous. As lead times are shortened and the need to reduce product costs increases, manufacturing operations managers often look first to reduce tooling costs. Though material prices might fluctuate, tool prices are stable, easy to pinpoint, and therefore an easy target.

But tooling cost isn't simply a purchase price. According to CNC machining and tooling design company **Dawson Shanahan**, tooling is "the process of designing and engineering the tools that are necessary to manufacture parts or components." Tooling encompasses processes and effort, both of which bring additional, sometimes hidden, costs.

The characteristics of the tooling selected determine the quality and precision of the finished part, as well as the speed and repeatability of production. Higher performance tooling, such as **polycrystalline diamond** (PCD), **chemical vapor deposition diamond** (CVD) or **polycrystalline cubic boron nitride** (PCBN), is a larger investment than a general purpose **carbide insert**, yet can **provide savings** in other areas.

"[C]onsider how the cost of both tooling and the overall project can best be reduced, while ensuring all other criteria, such as part quality and delivery deadlines, remain unaffected," finds Dawson Shanahan

in a *white paper* on tooling. “[I]t can be too easy to focus solely on the cost of tooling without appreciating that this may actually lead to higher part costs once the project enters the production phase; It can often be better to invest slightly more in the initial tooling development if this leads to a significant reduction in part costs—a factor which is especially relevant of course in high-volume projects.”

## Tooling Costs Tiny as a Percentage of Total Costs

A study on tooling acquisition costs found it represented **3 percent** of total manufacturing costs, while labor and machinery made up 58 percent. Common sense would suggest that the dollar amount in savings from reducing the value of the smaller number would produce only a miniscule benefit to the overall cost.

By allowing more parts to be machined per hour or per shift, a high-performance cutting tool reduces the impact of both of these big contributors to part cost, finds the paper “The New Rules of Cutting Tools,” a collection of research and tooling analysis *articles* from Diamond Innovations, Precision Dormer and Sandvik Coromant.

“The high-performance tool may or may not be the right choice—but the price is too small a factor to make that determination,” the companies claim.

## Getting Started: Calculators to Help Gather Data Points

If your shop is relatively small, automating software for each machine might seem like overkill—at least initially.

If so, consider ways for your machinists to gather data at specified times during their shifts. Then, managers can collate and look for patterns.

We have a couple of calculators that you can tap to help with your data gathering efforts and analytics. Check out both our *Productivity Calculator* and also our *Machining Calculator*.

The Productivity Calculator can help you look for potential opportunities for improving cycle time for cutting, as well as across a variety of other tooling processes. The Machining Calculator provides one-stop shopping for the most commonly used machining calculations.

Not ready to calculate, but want to learn more? Here are a few other areas of tooling to explore:

*How Workholding Can Improve Your CNC Lathe Operation*

*How to Maximize Machine Productivity with Toolholders*

*Evolution of Tooling: How to Meet Just-In-Time Customer Demands*

## Taking Control of Hidden Costs

If reducing tool costs will not necessarily result in a lower cost of production, what will? A landmark manufacturing study reported in the *Harvard Business Review* discusses ways to identify and minimize overhead costs within a manufacturing facility.

“High manufacturing overhead has a dramatic effect on profit and competitiveness,” write authors Jeffrey G. Miller and Thomas E. Vollmann. However, “most production managers understand what it is that drives direct labor and materials costs, but they are much less aware of what drives overhead costs.”

Miller and Vollmann believe that the bulk of manufacturing overhead occurs in the “hidden factory,” through individual transactions involving exchange of materials and/or information that don’t directly produce a product. These transactions provide less tangible benefits to the customer, such as on-time delivery, quality, variety and improved design.

Transactions may include ordering, executing and confirming the movement of materials; ensuring that the supplies of materials, labor and capacity are met; identification and communication of quality specifications and certification that these are met; and updating systems to accommodate changes in engineering designs, schedules, routings, standards, materials specifications and bills of material.

Since Miller and Vollmann believe transactions are responsible for most overhead costs in the hidden factory, then the key to managing overheads is to control the transactions that drive them. By examining the steps in each transaction, production managers can simplify the workflow and cut total costs.

An understanding of the hidden costs in manufacturing has led many organizations toward trying to uncover these true transactional costs in more detailed ways—and has been found to help tie them together as activities. Many companies, led by financial analysis, have adopted activity-based costing as part of an activity-based management program.

“Activity-based costing (ABC) assists companies in more accurately costing their products,” finds joint research from the University of Southern Indiana and Ohio University. “While traditional costing systems rely on a simple measure for the allocation of overhead, activity-based costing relies on cost pools and cost drivers to assign cost in accordance with overhead usage.”

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## How Machine Performance Affects and Is Related to Tool Savings

How would reducing transactions look in the case of machine tool manufacturing?

Some hidden costs can be minimized through the initial selection of both machine and tooling, which are intimately related and ideally should be considered together before purchase, according to Diamond Innovations et al. That way machine features can be matched to the product and the tooling, eliminating unnecessary change transactions while taking full advantage of the advanced capabilities of both tool and machine.

For example, sophisticated, high-performance tooling might require a positional B-axis in order to achieve optimal performance, but it would be costly to install retroactively.

Another example would be selection of tools and toolholders designed to use a focused stream of

coolant to lift the chip away from the cut for faster speed and longer tool life—a wasted advantage if the machine is not equipped with high-pressure coolant capability.

The choice of tools may also affect cycle times, as well as scrap and burden rates, with their respective hidden labor and material costs.

Transactions can be greatly reduced through the use of modular tooling, which allow different milling and drilling tips to be quickly exchanged, minimizing setup time and reducing the number of tool positions required for the machine. Labor savings might also be achieved with innovative work-fixturing solutions.

According to Dawson Shanahan, other factors to be considered in selecting tooling are the tolerances required in the finished part, which will affect tooling configuration; mechanical strength and rigidity of the tool, which ensures workpiece accuracy, repeatability and quality; and cutting tool strength, needed for withstanding the machining forces in high-volume production. All of these contribute to the total cost-effectiveness of the tooling and must be considered along with simple price.

“Taking a holistic view of each project can therefore have a beneficial impact, not only on cost, but also on quality, part performance and delivery,” says Dawson Shanahan.

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