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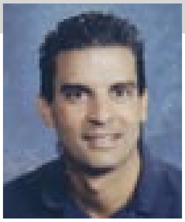
BY MIKE PRINCIPATO



To blog or not to blog

Every once in a while, I pen a column so important, so timely, so significant in scope and breadth, that to ignore its wisdom would be risking the future prosperity of your shop and the contract manufacturing industry as we know it.

This is not that column.

To describe how immeasurably over-hyped this month's topic is to most practical-minded manufacturing executives, I am forced to resort to an expression I use to silence my teenagers when they bicker over the vital issues of their self-absorbed lives and times.

Teenaged Son: "Dad, she clogged the shower drain again with her hair. I'm not touching that thing!"

Teenaged Daughter: "Dad, he's full of it! That's his hair!"

Me: "Guys, this falls under the category of …"

All, in unison: "Who gives a rodent's behind!?!"

By blogging, you run a real risk of reducing your current image as a titan of industry to a doofus with an outsized ego.

This brings me to the now ubiquitous topic of blogging, which, for most of us, falls under the same category.

For those who have been living on another planet for the last year, blogging is essentially the practice of regularly sharing the details of your personal and professional life online in diary format, whether or not those details are of interest to anyone other than your mother.

Blogging has served the occasional useful purpose. For example, it has kept legions of PR flacks employed. They now spend many of their working hours editing the boss' daily exhortation on productivity, teamwork, shared vision and paradigm shifting. They craft every word and phrase to ensure each blog entry has that spontaneous feel.

It's difficult for me to understand how blogging in the business world, which most often amounts to a daily stream of inane clichés, has become mission-critical for bosses. In the words of a member of the self-appointed tech cognoscenti, "Every C-level executive who has to manage expectations, strategic direction, morale, uncertainty, risk and people's time should most certainly be doing a blog." Whew! That means the same CEO whose trade-show keynote address was so boring it put the CNC programmers into sleep mode now feels compelled to share the same snore-inducing drivel with his employees, suppliers and anyone else in cyberspace unlucky enough to come across it while Googling.

I acknowledge that blogging presents a marketing opportunity for some, and a low-cost one at that. After all, the so-called blogosphere is full of free sites that are more than happy to host your streams of consciousness, so all that's left to do is set aside the time to write. Right?

Wrong. First, most people find writing to be a time-sapping struggle. Although the only antidote for writer's block is, in fact, to write a lot, the learning curve shouldn't be public because it ain't pretty. The e-mails that feature typos, malapropisms and grammatical errors that endear you as a "regular guy" to your small circle of friends won't be nearly as appealing to the strangers who find and read your blog. By blogging, you run a real risk of reducing your current image as a titan of industry to a doofus with an outsized ego.

Second, the really good bloggers—typically professional communicators who are simply applying well-honed journalism and copywriting skills to a new medium—know that a great blog is a purposefully written conversation driver. It's designed to provoke positive and productive discourse on a subject. Although not as totally spontaneous as a conversation, a blog is close, which means that negative replies to your "half" of the "conversation" can derail your intentions—or worse.

Consider, for example, a manufacturing executive who wants to cultivate greater loyalty among his customers by blogging about the great strides his company has made in lead-time reduction. A posting by one irate customer whose order shipped late can drive a stake through the heart of that well-intentioned blog, if not handled carefully.

To blog or not to blog is the question, and for most small businesses, the answer is "not." So let me propose a revolutionary, alternative idea for an industry whose players usually cater to fewer than 20 major customers each: Get off your butt and go visit your customers.

About the Author

Mike Principato is a metalworking industry consultant and former owner of a midsized CNC and EDM shop in Pennsylvania. He can be e-mailed at ctemag1@netzero.net.

Parts-handling equipment

When it comes to handling parts during the manufacturing process, human handling often is not desirable. Whether moving parts in and out of a machine, from one machine to another or from a machine to an inspection or packaging area, automated parts handling is generally more efficient and productive. Automation equipment includes conveyors, part loaders, pick-and-place robots and palletized workholding systems.

Conventional belt conveyors are powered by motors attached to the side of the conveyors and are usually chain-driven. Magnetic conveyors are also available, where permanently lubricated drive chains move permanently charged ceramic or rare-earth magnets inside the conveyor housing. These magnets, in turn, move ferrous materials along the conveyor's slider beds.

Some of the more common types of loaders include magazine loaders, vibratory bowl feeders, through-feed loaders and programmable shuttle loaders. A magazine loader, which usually holds a large number of to-be-machined parts, receives a signal to load a part into a machine and a signal to unload it when the machine stops cutting or grinding. For example, in a centerless grinder with a magazine loader, once a signal is given to the machine, the part will drop into a vee and a pusher will push the part up against a stop. Then, once a signal is given to grind the part, the wheels contact the part, grind it and after the grinding cycle is completed, the part drops into an exit conveyor and another part is loaded into the machine.

With a vibratory bowl feeder, parts are placed in a bowl and, as it vibrates, they are fed individually onto a conveyor, which, in turn, feeds them to the machine.

With the through-feed process, parts first enter the front end of a machine and then exit out the back after the machining process is completed. The part can then be unloaded onto another conveyor and transported to another machine or wherever it needs to go. For example, a shaft might be fed into the front end of one centerless grinder for roughing and then travel on the exit conveyor to a second centerless grinder for finishing.

A shuttle-type loader has a hopper and parts are gravity-fed one by one onto a conveyor or an area for a programmable pick-and-place loader or robot to feed it into the machine.

When implementing a pick-and-place robot, the end user needs to identify—at minimum—the part size, throughput rate and locations of the pick-and-place points. With this information, a systems integrator can determine the optimal robot size, speed and mounting configuration.

There are four main elements of a pick-and-place robot: the robot arm, the controller hardware, the software and the robot's end-of-arm tooling. For the machine-tending system, the main components include a feeding device to present the parts so they can be picked and placed, and a master control to coordinate activity among the various pieces of equipment, which might include a conveyor.

A multiple-axis robot is for more complex picking and placing, like in an assembly application where a high degree of accuracy is needed and throughput requirements aren't quite as high. For high-speed pick-and place applications, end users often select 2- or 3-axis linear slides.

Another area where the level of complexity comes into play is the end-of-arm tooling. The tooling could be a 2-jaw gripper, a 3-jaw for chucker-type parts or an integrated vision and force-sensing gripper. Suction cups are another option for end-of-arm tooling.

Technically, a robot must be reprogrammable. Devices not capable of being reprogrammed are better defined as "dedicated automation."

There are two basic types of robots: servomotor controlled and nonservomotor controlled. Nonservo robots are inexpensive, easy to understand and set up, have good precision with high reliability and can be a logical choice for point-to-point transfer. Nonservo robots usually operate along the axes of a coordinate system. Motion is controlled through the use of a limited number of stops and the actual path between points may be difficult to define.

Servo-controlled robots provide a wider range of capabilities, can perform multiple point-to-point transfers along a controlled path and can be programmed to avoid an obstruction. Servo control allows the robot to more accurately position itself in relation to the object it needs to pick and place and provides continuous-loop feedback.

Servo-controlled robots also enable vision systems and force sensors to be added. A vision system is appropriate if there is part variability or if many different types of parts are coming in on a somewhat random basis and the machinist doesn't run a large batch of one type of part.

Rimrock Automation

When selecting a pick-and-place robot, the end user needs to identify part size. This is in addition to throughput rate and the locations of pick-and-place points.

Palletized workholding is another automated parts-handling system. A pallet is a fixture that is calibrated to the machine. Parts set up on a pallet can be shuttled in and out of a machine easily or from one machine to another. This allows a palleted part or pallet of parts to be machined while the machinist sets up the next part or pallet for machining.

Parts can be positioned directly on a pallet or fixtured on a palletized tombstone. In addition, a machinist can work on a part that is too large for a machine's work envelope by machining one end and then turning the pallet around to machine the part's other end.

Sharpen your cutter grinding skills

BY JAMES A. HARVEY

The essence of skillful cutter grinding is producing cutting tools that are sharp yet sturdy, cut with little pressure and evacuate chips effectively. When a machining problem arises, often it can be traced to a faulty cutter. If you know how to choose, grind, alter and inspect cutters, you'll be able to do virtually any job that comes along.

Cutter grinding is an area of metalcutting that separates the craftsman from the hack. Paradoxically, cutter geometry is not as complicated as many tool manufacturers would have you believe. A range of cutter geometries and grades exist that will work for any given job.

I remember asking an accomplished machinist what shape tip he liked to use for fly cutting. His answer—"anything"—surprised me. But thinking back, I realize how accurate his answer was. He was right as long as you add a qualification: The leading edge of the cutter must be the first and only thing to contact the workpiece. As long as that is true, just about any shape will cut.

The following suggestions are meant to help you sharpen your cutter grinding skills as well as your machining skills.

■ **Grind cutters with a few degrees of positive rake, when possible, so they cut with less pressure.**

The rake angle of a cutting tool is the angle the chips slide over. I generally prefer positive-rake cutters because they tend to cut cleaner surfaces with less pressure. About 5° usually does the trick. Too much rake and relief, which is the angle that determines the acuteness of the cutting edge, needlessly weakens a cutting edge.

Many factory-ground right- and left-hand brazed carbide lathe, or turning, tools have rake, relief and clearance angles of about 5°. (Clearance angles provide clearance between the tool and workpiece.) That angle is better for roughing than finishing. I prefer a little more relief and clearance on lathe tools when finishing.

All images: J. Harvey

Web-thinned drill bits and center drills cut with less pressure. When web-thinning, don't make the drill tip too weak. Reducing the thickness of the web by about 50 to 60 percent is usually adequate to reduce cutting pressure.

■ **Web-thin drill bits and center drills so they cut with less pressure.**

Although cutter grinders are available that sharpen and web-thin drill bits using special fixturing, I have always done it by hand.

There are a couple of things you should be aware of when web-thinning. First, you don't want to make the drill tip too weak. Reducing the thickness of the web (the material remaining between the flutes of a drill bit) by about 50 to 60 percent is usually adequate to reduce cutting pressure. Second, it's best to grind the web area so it has a slightly positive rake. This enhances chip removal.

I like to think of web-thinning as a process of extending the pre-existing flutes. Blending the web-thinned area into the pre-existing flutes while maintaining a slightly positive rake works well. For drill bits to cut close to size, it's best to maintain as much symmetry as possible in all aspects of drill grinding, including web-thinning.

■ **Avoid grinding chipbreakers into the tops of lathe tools.**

Some may disagree, but, in my experience, the only thing grinding a chipbreaker into a lathe tool does is shorten tool life.

Chipbreaking is controlled more effectively with machining parameters. Increasing the feed and reducing the DOC helps curl chips. Remember, when using any given set of machining parameters as a starting point, if you double the feed and halve the DOC, the cutting time will be the same. Chips produced with high feed rates help keep the workpiece cool, because much of the heat generated in the cut is removed with the chips. Long chips are OK as long as they curl tightly. One way to break stubborn lathe chips is to intermittently stop and start the carriage feed.

Another factor that influences the way chips curl is tip radius. A smaller tip radius seems to curl chips better than a larger one. Also, having the leading edge of a lathe tool set close to 90° to the axis of the part helps curl chips.

■ **Use high-helix carbide endmills to produce smooth surfaces.**

Although a little pricey, high-helix carbide endmills work well when finishing difficult-to-machine materials, such as stainless steel, because they impart superior surface finishes.

■ **For many machining applications, apply tools made from "middle of the road" carbide grades.**

Under laboratory and high-production conditions, you could probably increase material-removal rates and tool life by experimenting with different carbide grades, coatings and chipbreakers. For low-production and prototype machining, standard-quality tungsten carbide works well. Hard-grade carbides, such as C-8, are quite brittle and chip easily.

Because I am an advocate of removing metal quickly via high feed rates, I prefer the "softer" but tougher grades, such as C-2 and C-5, which don't chip so easily.

About the Author

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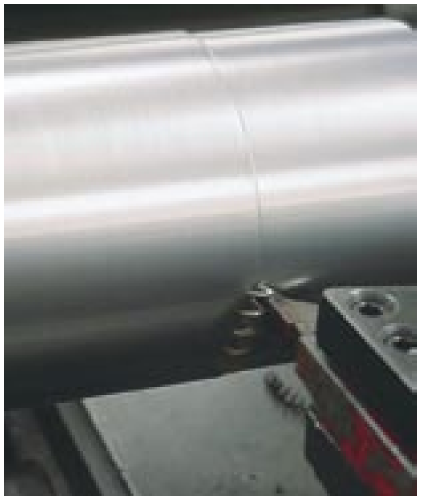


Chipbreaking can be controlled effectively by choosing the proper machining parameters. Increasing the feed and reducing the DOC helps curl chips. Chips produced with high feed rates help keep the workpiece cool.

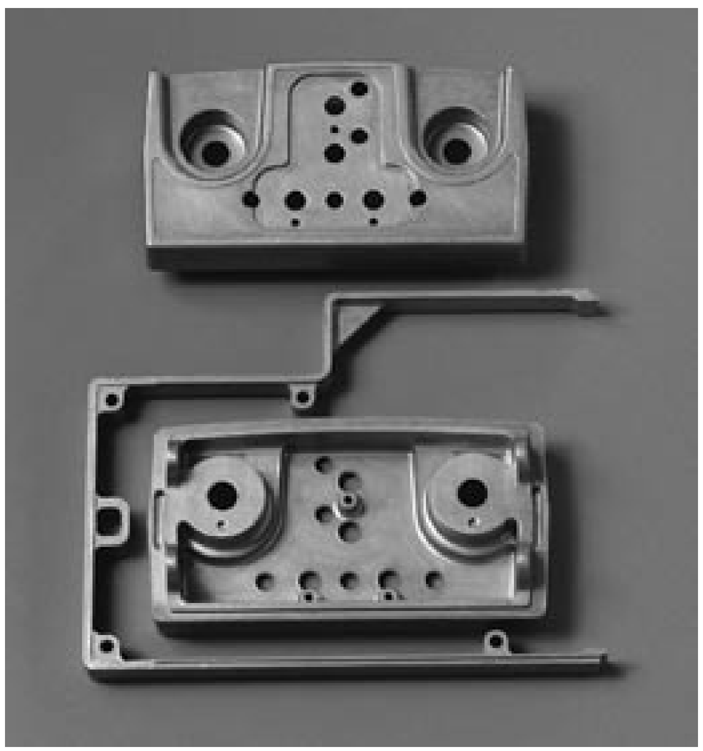
Casework

BY BILL KENNEDY, CONTRIBUTING EDITOR

CNC Technologies Inc. is a shop that finish-machines aluminum, zinc and magnesium die castings for its parent company, Chicago White Metal Casting Inc.

When special customer needs arise, the shop also provides custom design and machining services. CNC Technologies employed these services for the production of a magnesium case, or belt pack, that's part of a wireless-communication system commonly used by football coaches.

For a single-channel version of the case, Chicago White Metal cast an end cap and two halves of the case. Later, the customer sought to market a larger, two-channel version. The anticipated production run for the two-channel case was smaller, and the customer preferred not to invest in a new set of dies. In response, CNC Technologies helped design and then machined a delicate spacer to fit between the halves of the case to increase its volume, as well as a new, larger, two-outlet end cap.



B. Kennedy

To fill a special customer request, CNC Technologies machined a delicate spacer and two-outlet end cap out of magnesium for a wireless-communication case.

CNC Technologies machined the cap from a 1"×2"×4" block of AZ31B magnesium alloy on a vertical machining center. Magnesium is often preferred for today's smaller, lighter and more energy-efficient products. Parts made of it weigh about 35 percent less than their aluminum equivalents, yet they are just as strong.

Brian Andrews, vice president of CNC production, said magnesium machines much like aluminum but requires special care because chips can ignite and burn fiercely. He noted that CNC Technologies is known for its expertise in machining magnesium and has developed specific procedures for handling it safely.

To permit drilling of through-holes, the stock was clamped on thin, parallel rails located in the VMC. The interior of the cap was machined first. An SGS Ski-Carb ¼"-dia., 45° helix, 2-flute carbide endmill run at 10,000 rpm and 60 ipm roughed out the cap's cavity and the four lugs on its periphery.

After roughing with the larger endmill, a variety of ⅛"- and 1/16"-dia. square and ball endmills roughed and finished cavity details.

Next, 16 holes were drilled with solid-carbide circuit-board drills. Andrews said he used the circuit-board drills because "the entire drill is about 1" long and flute length is real short, which means you can go a lot faster." The drills ran at 10,000 rpm and 15 to 20 ipm, and "we peck them, depending on the depth of the hole."

While tolerances for the cap and spacer are typically ±0.005", the two largest holes in the cap were drilled and reamed to within +0.001"/-0.000" of a 0.277"-dia. so they could provide precise location for the part in subsequent operations. Machining the cap interior consumed about 15 minutes.

In the next step, the cap was flipped and located on two dowel pins ground to fit the reamed holes. With clamps on one side of the part, the ¼" endmill machined rounded pockets around the two locating holes and created 0.650"-dia., 0.50"-deep counterbores in the pockets.

The sides of a die-cast part must incorporate a degree of taper, or draft, so the part can be removed from the mold. In order for the new cap to match the two cast halves of the case, the three unclamped sides of the cap were profile-milled with a 3° tapered HSS endmill run at 3,200 rpm and 20 ipm. It took two passes. The first pass established the profile, with the tapered endmill removing more material from the top of the cap than the bottom. The second pass removed a uniform amount of material and imparted an even surface finish.

To hold the cap for the next steps, CNC Technologies employed two special clamps designed to apply pressure in the flat areas of the milled pockets, between the cap edge and the counterbores. It took two steps to finish the counterbores and create radiused fillets at their bottoms. First, the ¼" endmill finished each counterbore wall to the depth where the fillet began and then finished the floor to the fillet's edge.

A 1/16"-dia. ball endmill then blended the two finished surfaces to create the fillet. The small endmill alone could perform the finishing work and make the fillet, but that "just takes forever," Andrews said. "I finish all the features with the largest tool I can, then go in with the ball endmill and create that radius."

A combination of ⅛"- and 1/16"-dia. endmills finished details on the top of the cap, and the 3° tapered endmill machined the taper on the fourth side of the cap. This operation took 12 minutes.

The next operation took place on two stations while still on the VMC. For the first, the cap was flipped vertically and mounted to a 90° angle plate using the two locating holes. Two of the lugs roughed earlier at the edge were profiled round and then 0.440"-dia. holes were drilled and tapped in them. At the second station, the cap was flipped 180° and the process was repeated. Andrews noted that the relatively small production volume dictated the use of manual clamping. This operation took 5 minutes.

The greater challenge on this job was machining the delicate spacer from a ½"×5"×4", 0.68-lb. piece of AZ31B magnesium. The finished 0.04-lb. spacer's walls were only 0.40" high and 0.090" thick.

The stock was clamped in a vise, along its 5" sides, on the VMC. First, a ½"-dia., 45° helix, 2-flute, square carbide endmill roughed the spacer's highest features, milling 0.030"-wide, raised ribs on two sections of the 5" sides. Then a ¼"-dia. endmill roughed other areas, including four pads that later would be drilled, a round-edged 0.485"×0.333" rectangular feature and a triangular fillet to add strength. Smaller tools, including ⅛"- and 1/16"-dia. endmills, finished details, and a circuit-board drill was employed to drill four holes. The 3° tapered endmill profiled halfway down the spacer's outer wall; this was done, again, to mimic the taper of the case's cast halves.

Next, five holes were drilled in the center, or waste area, of the spacer for use in locating and holding the part later. Two 0.251"-dia. holes, 3" apart and offset ½" to prevent mispositioning, were spot-drilled, drilled and reamed. Three more holes, 0.281" in diameter, were drilled in a triangular pattern for screws that would secure the part to the fixture. Machining the first side of the spacer, which is cut from the plate and the rest of which is waste, consumed about 15 minutes.

For the final set of operations, the part was turned over, located on two ¼"-dia. pins and screwed to the fixture with socket-head cap screws. The ¼" endmill finished the top edges of the part, and ⅛" and 1/16" endmills machined details. Then the 3° tapered endmill profiled the outside of the spacer, meeting the taper created in the previous operation and releasing the part from the surrounding stock.

Andrews designed special clamps to hold the spacer so it could be cut from the stock remaining in the center of the part. "It was very small along the outside wall," he said. "The entire thickness of the back wall was about 0.090", and the little rib sticking up off it was about 0.030", so I had a 0.060" step, or ledge, on which to clamp. The clamps we designed just held on that 0.060" ledge."

Three clamps gripped one side of the part and two held another. The third side of the spacer had no raised rib. For that, Andrews designed a clamp that held the outside of the wall, lipped over and pushed down. "You can't push it too far," he said. "There is a lot of caution and care that is taken in clamping," noting that it is easy to dent the relatively soft magnesium.

A ¼" endmill roughed the center area of the spacer, removing most of the material and creating a path for a smaller tool. The final passes were made with an ⅛" endmill. "We had to slow it down; the wall was so thin, you could create some chatter," Andrews said. He ran the endmills at about the same spindle speed as previously, but "I reduced my chip load quite a bit, roughing at 30 ipm but finishing more in the range of 20 ipm." The final operation consumed about 20 minutes.

For more information about CNC Technologies, call (630) 238-1390 or visit www.cnc-technology.com.

BY MICHAEL DEREN

Go, manufacturing, go

When people in the manufacturing industry talk, one of the first questions they ask each other is, "How's business?" These days, the usual response is, "Great! We're buried with work." Then, the inevitable statement that follows is, "I don't know how we're going to get the work out, though. We just can't find enough help."

Sure, most employees can be persuaded to work some overtime, but that's only a short-term solution. What about finding new employees? Although classified ads are plentiful for machinists, the takers, unfortunately, are few and far between.

This is partly because workers who are available often don't have the required skills and become discouraged. I found a couple of statements in a March report from the U.S. Department of Labor, Bureau of Labor Statistics, truly amazing. Here's one of them: "There were 386,000 discouraged workers in February ... . Discouraged workers were not currently looking for work, specifically because they believed no jobs were available for them."

Let's put our best foot forward and devise an advertising campaign that promotes companies that provide a clean working environment and offer good wages and benefits.

No jobs for them? Untold numbers of manufacturing companies are looking for employees and can't find them. Sure, some of the discouraged workers are the hardcore unemployed who just don't want to work. But I can't imagine that the bulk of these discouraged workers would rather be unemployed than earning a good buck in our industry.

If people knew more about manufacturing and the opportunities it offers, could the industry attract more employees? I bet it could.

Here's another statement from the same report that just killed me: "Employment in food services and drinking places increased by 21,000 in February. Over the year, this industry has added 203,000 jobs." Do these people know they're only earning a fraction of what they could be earning in manufacturing?

As I see it, manufacturing has a definite public-relations problem. Most people I speak with outside of the industry have the misconception that I work in a noisy, dirty, smelly and unsafe environment. I guess they think I'm hard of hearing, wear grungy clothes, reek of oil and am missing fingers and limbs.

I don't believe an individual company can change this misconception on its own. The industry needs to come up with a solution collectively.

The Go RVing Coalition and the Grow Boating Initiative could serve as examples. The Go RVing Coalition was formed about 12 years ago by representatives of various recreational-vehicle industry trade groups to "distribute information about the benefits of RV travel, products and services." The Grow Boating Initiative began a couple of years ago as "an industry-wide integrated approach to improve the boating experience." Both were formed to help grow their respective industries. Why can't the manufacturing industry follow suit?

Why don't manufacturing trade organizations join forces and create something like Go Man (Go Manufacturing) or Grow Manufacturing? OK, maybe it's a little hokey, but I'm sure that's what they said at first about Go RVing and Grow Boating. Regardless of the catch phrase or the initiative's name, the focus should be to attract newcomers to the manufacturing workforce.

Let's put our best foot forward and devise an advertising campaign that promotes companies that provide a clean working environment and offer good wages and benefits. Let's demonstrate the high-tech equipment prevalent in our industry. Let's show the advancement opportunities, not only within a company but within the industry as a whole. Let's show well-known products and components being manufactured. Let's show the lifestyles that can be attained with the wages a manufacturing job offers.

I don't know if an initiative or coalition is the answer, but if we don't try a new and different approach, we will all lose. Manufacturing will eventually disappear from our shores and we will be relegated to being a service-oriented society asking foreign visitors, "Would you like fries with that?" △

About the Author

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