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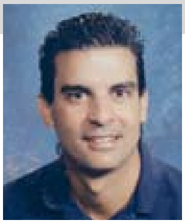
BY MIKE PRINCIPATO



Do you know where your future is?

The start of a new year is always an appropriate time to evaluate one's place in the world or, for the purposes of this column, U.S. manufacturing's place in the world.

First off, I have almost limitless faith in the promise of democracy, American ingenuity and the U.S.'s ability to succeed whenever we earnestly apply our considerable collective national resources. I'm also a pragmatist who tries to prevent that rosy perspective from overruling common sense and good judgment, particularly when it comes to business decisions.

That's why I'm worried. Of course, I'm worried about the usual stuff: global competition, the ever-shrinking pool of skilled metalcutting labor and the decline of manufacturing employment. Nothing new there, and when viewed through a long lens, those challenges are simply part of the evolution of global capitalism. To pretend otherwise is to deny the reasons behind the transfer of global economic leadership during the last century from Western Europe to the U.S. in the first place: Well-resourced, scrappier and hungrier upstarts always triumph in the world of commerce. We took it to the Europeans in the early 20th century; now, Asians are taking it to us, at least in certain industries in which we are no longer the low-cost producer.

The march of global capitalism and its evolutionary effect on a low-skill labor force is like a force of nature beyond the control of mere mortals, immune to the election-year speechifying of politicians and—for ambitious entrepreneurs and employees in a free enterprise economy—creates at least as many opportunities as it destroys.

Of course, that bit of high-minded historical perspective isn't going to lift the spirits of anyone who's been laid off from a steel mill, an auto parts maker or a tool and die shop during the past decade. But before firing off an indignant e-mail to accuse me of insensitivity, ask yourself: Would you aspire today to the kind of jobs that used to exist in a post-World War II steel mill or on an assembly line in an outdated production plant? Would you wish such a job for your son or daughter? I didn't think so. Yet, in many cases, those are exactly the kind of jobs that have transferred offshore, right along with the metalcutting careers in hundreds of shops that supported those manufacturers.

The jury's out as to whether there's a cause-and-effect relationship between the loss of those jobs and the emergence of positions that didn't even exist in this country just a decade ago, such as in technology, health care and other "clean" industries. But U.S. employment is at record levels, even as manufacturing employment continues to decline.

So, I'm not lying awake at night worrying about such things. The march of global capitalism and its evolutionary effect on a low-skill labor force is like a force of nature beyond the control of mere mortals, immune to the election-year speechifying of politicians and—for ambitious entrepreneurs and employees in a free enterprise economy—creates at least as many opportunities as it destroys.

I'll tell you what I am worried about, however. I'm worried about an inattentive, self-indulgent U.S. citizenry who has forgotten this country's very brief history and the critical role sheer human ambition played in its rapid rise to economic power. I worry that if Henry Ford were growing up today, he'd be so caught up in the comings and goings of Tom Cruise and Katie Holmes, so poorly educated in math and science and so captivated by PlayStation 3 that he'd never get around to making cars.

I'm worried about a dysfunctional government increasingly populated by overgrown children of privilege who have limitless time to assassinate the character of "colleagues" even while moralizing about the nobility of public service, thus ensuring that the political life that once appealed to the country's best and brightest will continue to be a haven mostly for "Dumb and Dumber." We will pay a dear price for politicians' fiddling while economic policymaking burns.

Make no mistake about it: Calvin Coolidge, the 30th U.S. President, was right. The business of America is business. The business of America isn't government. It just seems that way lately.

And more than anything, this father worries that his teenaged son is interested in pursuing an engineering degree that in the next decade will be of higher value in China than America. I probably don't need to tell you how his mother feels about that.

Do I have some suggestions about how the U.S. can improve its situation? You bet I do, and I'll be writing about them over the next few months in my usual sensitive, politically correct style.

About the Author

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Skimming your way to a better workplace

BY LAROUX K. GILLESPIE

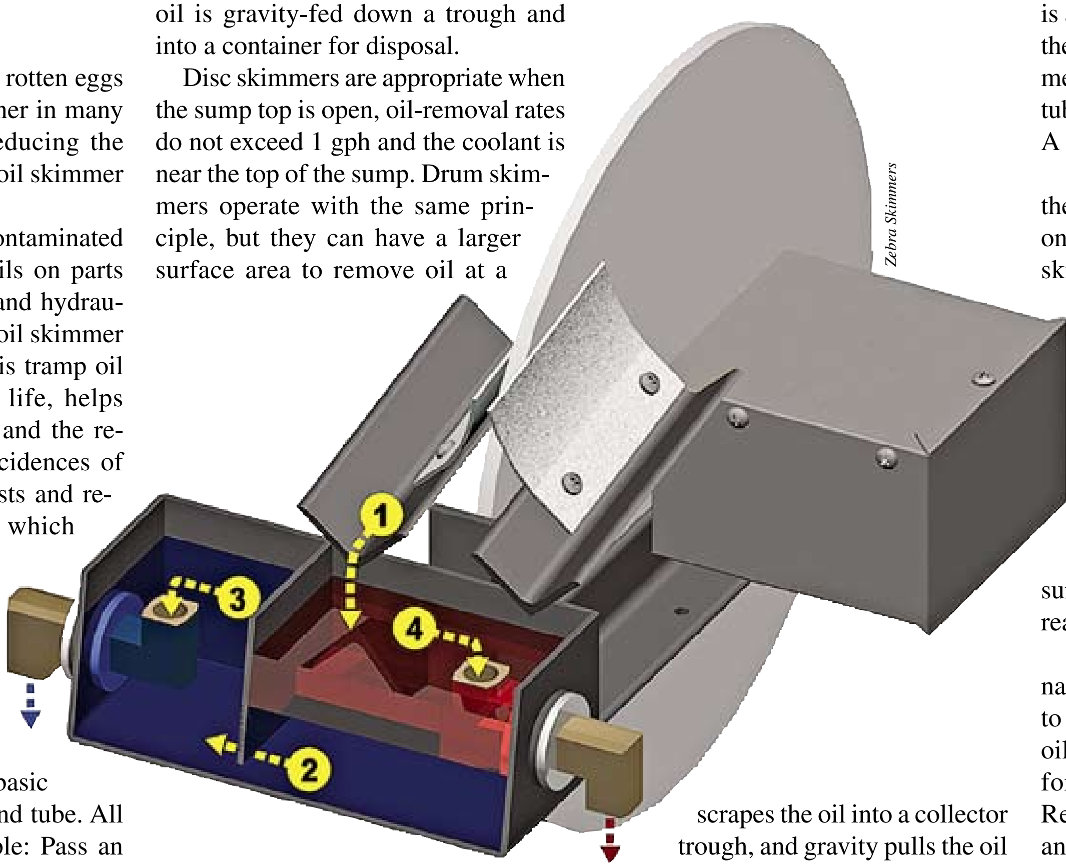
Coolant that smells like rotten eggs is an unwelcome partner in many machining operations. Reducing the problem is simple: Use an oil skimmer to remove the tramp oil.

Coolants can become contaminated with machine way oils, oils on parts from previous operations and hydraulic system leaks. Using an oil skimmer to continuously remove this tramp oil extends coolant and tool life, helps eliminate bacteria growth and the resulting smells, reduces incidences of dermatitis among machinists and reduces airborne oil mists, which workers inhale. Removing the tramp oil can also eliminate burn marks on parts caused when that oil hits the hot, just-machined surface.

Oil skimmers for machine shops come in four basic designs: disc, drum, belt and tube. All work off the same principle: Pass an object that oil attaches to through the oil, then scrape, or skim, the attached oil off the object into a collector. Because oil floats on the surface of coolants, each skimmer design positions the collector to pass through the coolant surface.

Disc skimmers, which sell for $100 to $200, sit near the top of the coolant sump and slowly rotate a large-diameter disk through the coolant. The disc's surface picks up the oil, and, as a portion of the disc rotates out of the liquid, a wiper blade physically scrapes oil from the surface. The 12"- to 24"-dia. disc continuously rotates through the coolant so the just-cleaned surface is soon in the solution again, ready to gather more oil. The removed oil is gravity-fed down a trough and into a container for disposal.

Disc skimmers are appropriate when the sump top is open, oil-removal rates do not exceed 1 gph and the coolant is near the top of the sump. Drum skimmers operate with the same principle, but they can have a larger surface area to remove oil at a faster rate.



Two blades scrape tramp oil off a disc. The oil (1) exits the right side (4) of the disc skimmer and coolant (2) returns to the sump from the left side (3).

If the coolant level falls significantly during machining or the machine does not allow positioning of a skimmer immediately above the coolant level, a belt skimmer is a better choice. These skimmers have polyurethane belts that are 1" to 4" wide and as long as 25'. A flat or cogged belt, similar to an automotive timing belt, is placed in the tank. As the belt rotates, it passes through the oil layer and oil is attracted to the belt surface. When the belt passes over the skimmer's top pulley, a blade scrapes the oil into a collector trough, and gravity pulls the oil into a container.

Belts typically remove from 1 qt. to 10 gal. of oil per hour, depending upon motor speed, oil type and viscosity, belt length and coolant temperature. A tensioner positions the belt at a predetermined depth in the tank. Wider belts remove oil faster. Belt skimmers typically cost $300 to $350.

The tube skimmer design uses an endless looped plastic tube to gather oil. As the tube is pulled up, oil is scraped off the tube's outer surface when it passes through a sharp-edge hole slightly bigger than the tube. A trough below the hole directs the oil into a collector on the side of the device. A sliding, dangling weight keeps the tube in the coolant.

Meg Grant, customer service representative for Zebra Skimmers, Chagrin Falls, Ohio, noted that a tube skimmer is appropriate when there is no room in the tank to put another style of skimmer. The oil-removal rate for a small tube skimmer is typically 1 qt. per hour. A tube skimmer costs about $300.

Most skimmers run continuously in the machine they are mounted to, but one plant, for example, installed an oil skimmer on a portable cart and runs the skimmer two times a week for 60 to 90 minutes at each of four machines. This arrangement minimizes equipment costs.

Coolant reservoirs need a settling tank large enough to allow an average sized droplet of oil to slowly rise to the coolant surface. Some of the oil floats just below the surface for a time, so skimmers need to reach into the coolant at least 1".

Skimmers can save money by eliminating the need to add costly biocides to the coolant, and by removing tramp oil that breaks down coolants, which forces faster coolant replenishment. Removing oil from exhausted coolants can also reduce hauling charges by eliminating the need to have the oil-contaminated coolant removed and only paying the hauler to take the tramp oil. In addition, skimmers reduce the cost of treating dermatitis, which can force work reassignment, cause workers to take sick days and increase worker compensation costs.

About the Author

LaRoux K. Gillespie is a retired manufacturing engineer and quality-assurance manager with a 40-year history of precision deburring. He is the author of 11 books on deburring and almost 200 technical reports and articles on precision machining. He can be e-mailed at laroux1@myvine.com.

Part of a base drive assembly, this 0.961"×3.228"×19.449" steel component helps position a laser in digital printing equipment.

High-tech response provides customer satisfaction

BY BILL KENNEDY, CONTRIBUTING EDITOR

Back when shops hammered plow blades out of iron, the way to satisfy customers was to respond to their inquiries, make parts accurately and deliver them on time. Today, part production techniques and the parts themselves are different, but the rules for satisfying customers haven't changed.

WDW Machine Inc. performs prototype and production machining for customers in the digital imaging, space communications and semiconductor equipment industries. Wilbur Webster, the company's founder, defines success simply: "We have good turnaround and really good accuracy. We have a reputation for getting jobs done when customers need them. We are honest with everybody."

Typical of WDW's work is a part it machines for Presstek Inc., a manufacturer of digital imaging technologies. Part of a base drive assembly, the 0.961"×3.228"×19.449" steel piece helps position a laser in digital printing equipment. The part has a variety of pockets and other features, more than 72 holes, squareness and parallelism requirements of ±0.0003", and tolerances as tight as ±0.0001". "If they saw the drawing, most people wouldn't even quote this job," Webster said.

Wilbur Webster, the company's founder, defines success simply: 'We have good turnaround and really good accuracy. We have a reputation for getting jobs done when customers need them. We are honest with everybody.'

WDW makes the part from a 1"×3.350"×19.625" bar of Optiplate-XM tool steel. The ground, stress-relieved and resulfurized material is a specialty product of Burgon Tool Steel that, according to Webster, "stays as flat as a pancake" and doesn't warp during machining.

WDW machines the part on a Kitamura MY-7 or MY-3XI vertical machining center, employing a variety of proprietary fixtures developed to produce the required accuracy.

The bar first is clamped on its 3.350" dimension and roughed parallel with a Stellram 1½"-dia. inserted milling cutter at 2,100 rpm, a 25-ipm feed and a 0.100" DOC. Then the bar is finished with a Walter 2"-dia. inserted cutter run at 3,600 rpm, 35 ipm and a 0.007" DOC to achieve the required squareness and parallelism.

Next, the bar is refixtured and faced with an Iscar 4"-dia. inserted cutter at 764 rpm, 22 ipm and a 0.030" DOC. An Iscar ¾"-dia. through-coolant drill is applied at 3,200 rpm and 13 ipm to start a pocket before an Iscar ½"-dia. solid-carbide endmill roughs the pocket at 3,000 rpm, 30 ipm and a 0.300" DOC. That endmill then roughs other features and pockets. Next, a Sumitomo 9⁄64"-dia. through-coolant drill makes thirty-six 0.350"-deep holes at 12,500 rpm and 60 ipm.

Following 12 other drilling, tapping and milling operations, the part is turned over, refixtured and the second side is faced and roughed with the same inserted milling cutter and roughing endmill used in the first clamping. Then, a coated solid-carbide endmill is run at 5,600 rpm, 40 ipm and a 0.275" DOC to rough the part's critical alignment rail. Like the process described previously, after a 7⁄64"-dia. coolant-through drill makes thirty-six 0.462"-deep holes at 12,500 rpm and 60 ipm, various other drilling, tapping and milling operations are performed.

In another fixture, more holes are drilled and tapped on both sides of the part. In the next-to-last setup, the part is reclamped again and mounting pads on its bottom are milled with a Walter 2"-dia., 5-flute, coated endmill run at 1,200 rpm, 18 ipm and a 0.006" DOC to ensure the part sits absolutely flat.

Finally, a Mastercut ½", 4-flute, TiAlN-coated, solid-carbide endmill run at 2,300 rpm and 22 ipm machines the alignment rail to a parallelism of ±0.0001" over a 14" length.

WDW deburrs the part and then sends it out for 0.0002"- to 0.0003"-thick electroless nickel plating. When it returns, the part is inspected and M3 Torx screws are used to attach linear guide rails, from THK Co. Ltd., to the alignment rail. After a slide and a saddle—also machined at WDW—are attached, the part is returned to the machining center for a final milling pass with a ½", 4-flute side-cutting endmill to ensure alignment.

WDW makes parts like this in three different sizes; the smallest is described here. Depending on part size and production schedules, either the 60.2"×25.6"-travel, 15,000-rpm MY-7 or the 30.0"×17.75"-travel, 10,000-rpm MY-3XI does the machining. Machinist Adam Webster said the Kitamura machines fit the shop's needs for accuracy and repeatability. "They are rugged box-way machines with geared heads and high torque," he said, "but they are actually quiet when you run them."

WDW expects production of this component—the smallest of the three—to be in the range of 450 pieces annually. To maximize its responsiveness and throughput during the run, the shop sought ways to reduce machining time. Initially, machining consumed about 86 minutes per part. At that time, the two sets of 36 holes were being drilled with HSS drills run at about 2,800 rpm and 12 ipm, utilizing a pecking cycle to clear chips.

To speed the process, WDW switched to through-coolant drills, which permitted a fivefold feed increase to 60 ipm and eliminated time-consuming pecking. The change reduced machining time by 20 minutes. Four more minutes per part were saved by substituting a solid-carbide roughing endmill for the inserted cutter previously applied for pocket roughing. The resulting machining time of 62 minutes represented a reduction of more than 25 percent.

Responsiveness and the willingness to take on a challenge pay off. "We get a lot of work because other machine shops simply don't respond to these customers," Webster said. "We do, and we make sure we get the parts out."

For more information about WDW Machine Inc., Hampstead, N.H., visit www.wdwmachine.com or call (603) 329-9604.

SmartCAM rises from the corporate ashes

BY BILL FANE

Like the legendary phoenix, SmartCAM is arising from the ashes. It was originally developed in the 1980s and for many years enjoyed its status as a popular stand-alone CAM program for developing G code for CNC machines.

Then the corporate bean counters got into the act. Within 8 years, it had been involved in four corporate acquisitions, mergers and re-acquisitions. In some cases, the software was simply the unwanted cousin; the new owners were really after some other division of its then-current owners. The program was shut down in the late 1990s in spite of its market success, and technical support ceased in 2001.

After a few years, a new company called SmartCAMcnc, Springfield, Ore., was founded to resurrect SmartCAM. A contributing factor in this decision was that in spite of a 5-year absence from the marketplace, more than half of the prior customer base was still using it, and for 50 percent of those users, it was still their only CAM software. That says something; how many people do you know still using software discontinued more than 5 years ago?

The rights to SmartCAM were acquired in late 2003, and the program returned in 2005.

Let's look at what is unique about SmartCAM that it has built such a loyal following.

The main feature is that the generated toolpath and its geometry live on different layers, and a user can easily flip back and forth between them.

As with other CAM programs, it has high-level routines for pocketing, drilling and so on. On the other hand, it also gives direct access to the low-level path itself. This means it is easy to massage, manipulate and tweak things directly to optimize the toolpath and eliminate little hiccups that occur in any CAM program.

Here are a couple of examples.

First, you may realize that the tool takes a pass or three or just part of a pass where it is not actually cutting anything. No problem; simply cut and delete the offending portion of the toolpath.

Experienced machinists have been heard to remark 'I like SmartCAM because it thinks the way I do.'

Second, some operations are so simple that they are not worth the effort to set up as a normal operation. If all you want to do is create a simple facing path, for example, all you need to do in SmartCAM is draw a line across the desired face and then specify that it is a toolpath, not geometry.

Similarly, toolpath additions can be made anywhere within the sequence of operations, and the sequence can easily be changed. This assumes, of course, that physical limitations are met. Obviously, you cannot have a finishing pass before roughing.

Experienced machinists have been heard to remark "I like SmartCAM because it thinks the way I do." Even though every machinist thinks differently, the program allows toolpaths to be easily manipulated to suit individual tastes.

Toolpath geometry in SmartCAM also has properties attached to it. Users can specify the thickness (DOC), the offset (inside, outside and center) and the clearance (distance at which a G00 rapid move becomes a G01 slow move).

SmartCAM comes with a variety of optimization tools. For example, the user can have it sort by tool number or by location. The latter case could be used to optimize the drilling of a series of holes, minimizing the slack time spent traversing between hole locations. This can pay off when machining a number of copies of the same complex part.

SmartCAM comes in several flavors, so you can buy exactly what you need. There are seven different products available to handle anything from basic 2-axis turning, laser cutting and wire EDMing to milling complex curved surfaces.

SmartCAM includes a powerful macrolanguage. This is one of the features that allows users to keep running the older release. They are able to program new functionality into it themselves. The macrolanguage lets users create function panels that are virtually indistinguishable from the native ones. For example, you could program macros to handle things such as standard sprues and runners when moldmaking, or a cast wheel manufacturer could build one that covered wheel diameter, rim width and number of spokes.

File compatibility is relatively limited. At present, the program imports and exports .DXF, .DWG, ACIS (.sat) and IGES (.igs) files. The translator can be used internally within SmartCAM or as a stand-alone application.

Installation is fairly simple. After purchasing a customer ID and pass code, you download the software from the company's Web site at www.smartcamcnc.com. After running the setup program, you then request an authorization code via e-mail. This is a 39-character alphanumeric code that must be entered into the license manager. Perhaps it was a quirk of my graphics card or driver, but I hit a minor hiccup when I tried to cut-and-paste this code from the e-mail into the license server. The usual right-click-and-paste sequence would not work, but Ctrl-V did.

By the company's own admission, SmartCAM Version 13 and now the latest Version 13.5 are mostly "catch up" releases to get it up-to-date with the current releases of the supported file formats. But the company does recognize a strong need to expand the compatibility list.

This does not mean that there is nothing new in the current releases. Version 13.5 includes new capabilities to help users organize, manage and streamline their work, including support for wheel mouses during panning, zooming and orbiting operations.

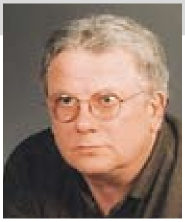
As part of the catch-up program, Version 14, due in March, will incorporate the tried-and-true ACIS modeling kernel, and it will also support Open GL for 3-D shaded views.

Given SmartCAMcnc's determination to get the software back to its old position of prominence—if not dominance—in the marketplace, it's safe to say that these will not be the only new features in the near future.

About the Author

Bill Fane is a former product engineering manager, a current instructor of mechanical design at the British Columbia Institute of Technology and an active member of the Vancouver AutoCAD Users Society. He can be e-mailed at Bill_Fane@bcit.ca.

BY MICHAEL DEREN



A learning experience

If asked what benefits their employer provides, most people would quickly respond health care, paid holidays and vacations. A couple of benefits many employees don't consider—but should take advantage of—are paid training and tuition reimbursement. These benefits can be expensive, easily surpassing the cost of health insurance, which we all know is a big one.

Company-provided training usually falls into three categories: in-house training conducted by the employer, vendor-conducted in-house training and vendor-conducted off-site training.

Examples of employer-conducted in-house training include training on new software, safety instruction and cross-training on equipment. This training can be valuable—for shops as well as their employees. For employees, such training would be costly to pursue independently. For shops, training can be a costly expense, though one that can increase productivity and reduce worker compensation claims. It may also be tax deductible.

In addition to the cost of instructors, shops should consider the cost of "lost time." If 10 workers attend a 4-hour training class, the employer has lost 40 billable hours. If the shop rate is $50 per hour, the company has invested a minimum of $2,000 in this little training session. If the company sends 100 employees, there goes a fast $20,000.

Vendors typically do not charge for conducting in-house training programs or seminars, but require a minimum attendance. However, the company receiving the training isn't getting a freebie. Again, the employer still invests its workers' time and loses productivity—initially.

Training at a vendor's facility is even costlier. For example, the engineering group where I work uses CAD/CAM software. With every upgrade, we attend training. This year, six of us went. The 1-week course cost about $2,000 per student. Because the course was held out of state, we had to drive to the vendor's facility, stay at a hotel and eat out. Adding up about $1,000 for travel and accommodations, course costs and about $2,000 in billable hours for each employee, the total amounted to $30,000, or $5,000 per employee. Sure, this benefits our employer in the long run, but it also benefits the employees, who become more valuable and more proficient with more training.

The other infrequently considered benefit, tuition reimbursement, is also offered by many employers. There are typically a few catches to this benefit. First, the course must be directly relevant to an employee's current position, which requires management approval. Second, workers must wait until after their probationary employment period, which is typically 90 days.

Tuition reimbursement provides a free education and the potential to move to a better position in the future.

Usually, there's a maximum amount of reimbursement per person, per year. I've seen amounts ranging from $1,000 to $2,500 per person, per year. A worker could take several classes at a state university or technical college while continuing to work.

Some companies reimburse on a tiered schedule, with 100 percent reimbursement for an A grade, 75 percent for a B, 50 percent for a C and no reimbursement for a D or lower. However, many companies reimburse fully for a C or higher.

Tuition reimbursement provides a free education and the potential to move to a better position in the future. At the very least, if a worker decides to switch companies, he has more to offer.

If your employer offers these two benefits, take advantage of them. It's a win-win situation. If your company doesn't offer them, talk to management. After explaining the advantages, maybe they'll offer some sort of in-house program or, at least, a partial reimbursement for off-site studies. △

About the Author

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